# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

*THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.*

*CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.*

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VOL. XLI., No. 25. FRIDAY, DECEMBER 21, 1906.


That the people in some towns of North Dakota are so short of fuel that they are near freezing, and have had to use up good new lumber for fuel, must be known to all our readers, for it has been one of the chief news "features" from Washington throughout the past week; but from the St. Paul despatches the distress seems to be just like what has been reported in past years, when our centralizing government at Washington was less benevolent than now. The distress is real, and in places alarming. We do not minimize it. But the trouble is in not stocking up with fuel before winter sets in. The railroads, justly or unjustly, lay the blame for this chiefly or wholly on the coal merchant; but as the railroads are the servants of the people President Roosevelt will probably ask them to supply themselves with enough cars and engines to carry the coal whenever it is offered. There are two serious difficulties with this scheme. If the railroads are unwilling it will be very hard to enforce; and, secondly, no amount of willingness can cope with a North Dakota blizzard. Not even the warm sympathy that radiates from the White House could have thawed out a path for a coal train over parts of the Great Northern on some days last week. The only practicable thing for the railroads to do toward averting fuel famines would be to make the rates on coal lower in the summer and fall. We should think that the railroads would do this voluntarily, though they could do so probably only at the expense of the grain traffic. If the Interstate Commerce Commission is going to try to carry out the President's wish and "do something" for the freezing farmers we suggest this plan; though we admit that it involves the assurance by a paternal government in the fall that the rates certainly will go up in December. How to do this with fairness we have not yet discovered. Our government has tried to do almost everything with railroad tariffs, but it has not made much headway toward forcing the published rates up.

The present grievances in the Northwest are clouded by being mixed up with another complaint, the lack of cars to carry grain to market. Here again true economy in transportation demands the distribution over months of traffic which the shippers desire to crowd into a few weeks. Mr. Hill has given the public and the government a few bits of cold logic on this point, which cannot be gainsaid. The railroads will, no doubt, continue to try as hard as they can to satisfy the grain shippers by buying new cars and engines, even at a sacrifice of economy in operation. The fact of this sacrifice of economy could be made plain, we think, even to the shipper who believes that the railroad oppresses him. Economy of transportation will, of course, often conflict with the interest of the grain seller and there must necessarily be concessions on both sides. The trouble is that there is no authority to decide which side should make the concession in any given case. Here is a chance for the Interstate Commerce Commission to do some useful philosophizing. What the railroads of the Northwest are doing just now is indicated by some of the replies of the railroad presidents to President Roosevelt's request, made through the Interstate Commerce Commission, that they hasten to relieve the distress. We quote:

Mr. Pennington (Minneapolis, St. Paul & Sault Ste. Marie): There is no blockade of freight or shortage of cars on our lines west of Minneapolis, except what is due to very bad blizzards in the last few days. You can rest assured we would exert every effort possible to relieve any suffering there may be on our line.

Mr. Harris (Burlington): We will endeavor to comply and furnish prompt and satisfactory service, and be much pleased to have any suggestions you will kindly make. There has been no general or protracted shortage of cars or condition of traffic on the Burlington road. Every year there is some car shortage and some congestion due to the fact that shippers, especially of coal, have little or no provision in the way of storage, and always decline to anticipate their orders; consequently there is a general demand for coal at the first real cold weather. We have been able to transport coal for all our customers with reasonable promptness, and to do something in the way of furnishing cars and transporting coal for other railroads. If there is any specific complaint on the Burlington road at present, it has not been made known to the officers of this company.

Mr. Hughitt (Chicago & North-Western): The Chicago & North-Western is not failing at this time, nor has it at any time failed, to furnish cars and to move them with reasonable promptness, both for fuel and other commodities. * * * I have during the last three weeks been in frequent communication with the Governor of South Dakota on this subject.

Mr. Hill (Great Northern): The coal scarcity in North Dakota is not due to want of cars. Thousands of empty cars have been moving from the head of Lake Superior to the grain fields during the fall, and coal ordered by local dealers has only been sufficient to supply from day to day. During the last two weeks there have been very heavy snow storms, with thermometer below zero. Snow drifts around stations from 6 to 15 feet deep have temporarily blocked railroads. Special trains of coal having right of way over all other traffic are being sent, and road is being opened as fast as conditions will allow. The fuel difficulty is temporary, and is being rapidly remedied. The general condition applying to all traffic is due to the rapid increase of tonnage to be moved. * * * Inability to secure labor at any price has badly delayed the completion of additional main tracks and terminals. We have orders for new locomotives to be delivered between now and June 1 for

25 per cent. increase in capacity and 6,000 freight cars to be delivered between January and September; capacity of the latter, 280,000 tons. We are now arranging for $60,000,000, covering next two years, to provide additional tracks, terminals, equipment and new lines where traffic is heaviest.

Mr. Earling (C., M. & St. P.): There has been no deficiency in car supply upon the lines of the Chicago, Milwaukee & St. Paul greater than usually occurs during the heavy fall movement of crops eastbound and merchandise and fuel westbound. The motive power of the company has been sufficient to move all traffic promptly. There has been no failure or unusual delay in transporting fuel or other necessaries of life. Movement of fuel has had preference over other westbound traffic for the past forty days, and such preference will be continued so long as necessity may exist.

Mr. Elliott (Northern Pacific): Our company has done and will continue to do all that it can to prevent suffering. The company realized in June and July last that the fuel supply was likely to be inadequate and that the great increase in general business would probably produce a congestion in the autumn. We therefore urged all dealers at time to look ahead and provide a stock of coal early and to try to find new sources of supply. For a month particular attention has been given to the movement of coal, and that commodity is now being given preference both as to cars and service. We have in a number of cases turned over company coal to protect local demands, and we are doing everything we can to take care of the situation, and will continue to do so.

## NEW CAPITAL FOR RAILROADS IN THE NORTHWEST.

Within the space of less than a week the two great Pacific Coast railroads in the Northwest and the road which is shortly to share with them control of the transcontinental traffic of that territory have announced large increases of their capital stocks. On December 11 President Hill of the Great Northern, in a circular to stockholders, announced that the company would issue $60,000,000 additional stock at par to stockholders to the extent of 40 per cent. of their present holdings. This will increase the outstanding stock from about $150,000,000 to $210,000,000. Three days later President Elliott, of the Northern Pacific, made public the terms of a new issue of $93,000,000 stock to be issued to stockholders at par to the extent of 60 per cent. of their holdings. This will increase the outstanding stock to $248,000,000. An additional $2,000,000 to be authorized will raise the total authorized capital to $250,000,000. On Monday of this week came the third of these announcements to the effect that the Chicago, Milwaukee & St. Paul would immediately issue something over $66,000,000 preferred and $33,000,000 common stock, which will bring up the total amount of both classes of stock outstanding to about $232,000,000. The Great Northern and Northern Pacific have only one class of stock outstanding. The St. Paul common and preferred issues are practically of one class. The total share capital stock of the Great Northern is therefore increased by 40 per cent., of the Northern Pacific by 60 per cent., and of the St. Paul by 75 per cent. The proceeds of the new stock issues of the two Hill roads are to be used principally in extending their facilities now overburdened by a tremendous rush of traffic. In other words, the new capital is to enable them to keep up with the wonderful and increasing prosperity of the Northwest. The St. Paul issue is to do the same thing in another way. It is the long expected financing for the Pacific Coast extension, a project which would never have been undertaken at all if the Northwest had not shown such great prosperity and resources. The St. Paul management is said to have figured that to build 1,500 miles of new main line in the Pacific Coast extension, together with 500 miles of branch line feeders, will cost $75,000,000, which is at the average rate of $37,500 per mile. In all probability this estimate will prove to be too small; the extra $25,000,000 of stock is to cover such contingency. Each of these three stock increases appears to be a necessary and useful extension of its resources by a great railroad company, which will result, not only in benefits to the road and its security holders, but as well in the great upbuilding of the territory served.

Since the increases can, in each case, be easily justified, either from the necessary and important betterment and extension of transportation facilities or to pay for a great new through line, it is interesting to observe the action of the stock market on announcement of these plans, as showing the contrast between the same fact considered as a part of the general railroad development, and as a market factor. The stocks of all three companies pay 7 per cent. in regular dividends. For a long time Great Northern stock has been held at high prices on expectation of valuable privileges to stockholders. The ore land certificates (now deducted from the price of the stock) are valued at about $85 a share. Their issue brought down the price of the stock from $325 to something over $230 a share, a price which still represented expectation of valuable rights. Similarly Northern Pacific was selling above 220 in expectation of a new stock issue, with rights to shareholders. On last Saturday St. Paul common sold within two points of 200 on similar expectation. The day before the Great Northern issue was announced, the stock sold at 230. Northern Pacific sold at 224 previous to announcement of its new issue. At the end of last week when the terms of both issues were known, Great Northern was down to 210 and Northern Pacific to 206. Since that time they have both sold down to 192. In the two days following announcement of its important rights for shareholders St. Paul common declined to 179. Thus is each case announcement of an issue of valuable rights to shareholders immediately resulted in a large drop in the market value of the shares. The brief explanation of this apparently unreasonable phenomenon is that the hopes of speculators had been raised too high. With their imaginations excited by the immense railroad earnings of the northwestern roads and the present general tendency toward more liberal distributions, they expected even larger gifts. Although the rights thus presented are worth about $25 a share on Great Northern, $30 on Northern Pacific and $35 on St. Paul, the stocks declined on disappointment by speculative holders that the free issues were not larger. There is no question but that the investment stockholders are more than satisfied with the distributions made.

## SINGLE EXPANSION AND LOWER PRESSURES.

The single-expansion locomotive, after all the efforts which have been made to supplant it, still stands as an acceptable device for handling railroad trains. Many years have passed since compound cylinders were first used in locomotive service and a considerable period has elapsed since the advent of superheating locomotives, but neither compounding nor superheating have yet gained for themselves a place of real security in the railroad practice of this country, while single-expansion locomotives are being built at a rate never before known. Notwithstanding these facts, train speeds have steadily increased, the loading behind tenders has been made greater, and the cost of operation has been reduced. One reason for this is to be found in the fact that many of those devices which have been put forward as capable of improving locomotive performance are effective only while the cylinders are using steam. They cannot effect a saving in the amount of coal used in firing up nor in maintaining the temperature of the machine while it is being held at stations or on sidings. Another reason is to be found in the exceptionally high qualities of the single-expansion locomotive which in spite of the competition which has been forced against it, and while remaining simple and unadorned, continues to do the business of the country. Its high efficiency has many times been referred to in these columns. The fact that it develops at its drawbar a horse-power in return for the consumption of from three to four pounds of coal per hour has recently been referred to. Its acceptability for hard and continuous work in return for a minimum of attention is well understood. But however complimentary to the single-expansion locomotive these reflections may appear, it will be well to remember always that it is not yet entirely perfect. The process of developing the single-expansion locomotive is in fact still an active one. Each year adds something to the sum of available information concerning its actions, by the application of which the proportions of some important part are fixed with greater certainty. It is by this slow process of evolution that the efficiency of the machine as a whole has been, and in the future will continue to be, raised. A matter of more than ordinary moment which has recently been brought to the attention of locomotive designers, the acceptance of which is likely to do much for the betterment of the locomotive, is a determination of the pressure which is most economical for such service. Pressures have for many years been steadily increasing till the limit of 200 lbs. has been reached and passed. It is now shown by authority, which will generally be accepted as satisfactory, that under ordinary conditions of service, a pressure of from 160 to 180 lbs. will be found more economical than any other.

As locomotives have grown in size, there has been a steady increase in boiler pressures, with the result that those who seek to further augment the power of locomotives have come almost intuitively to look forward to higher pressures as a means through which to accomplish the desired results. The feeling has been prevalent among locomotive users that high steam pressure is a necessary accompaniment to the development of high power. That such a conception is not justified by the facts is well shown by a paper recently read before the Western Railway Club,* presenting the

*"High Steam Pressure in Locomotive Service," a paper by W. F. M. Goss, presented at the November meeting of the Western Railway Club. This paper was published in full in the *Railroad Gazette* of Nov. 30, page 489 to 492.

results of a large number of tests disclosing the performance of the engine and boiler under a wide range of pressures. A conclusion of the paper is to the effect that single-expansion engines should ordinarily carry pressures no higher than 180 lbs., and that such locomotives will perform well the service expected of them if designed for pressures as low as 160 lbs. While the significance of this statement may not at first be fully appreciated, it is understood to have been based on carefully conducted work and sooner or later its force will doubtless be generally accepted. A full array of the data underlying the statement is promised to the reading public through the medium of a forthcoming report of the Carnegie Institution of Washington.

The assertion that a running pressure of from 160 to 180 lbs. will be found most economical for service in a single-expansion locomotive does not imply that existing locomotives designed for higher pressures should have their pressures reduced to the limit stated, for in all cases cylinders must be proportioned to boiler pressure, and ordinarily the pressure should not be reduced unless the cylinder diameters are increased. It may sometimes happen that a class of locomotives may be improved by imposing some reduction in pressure but such a course cannot be contemplated in a general proposition. Again, it should be borne in mind that a reduction of pressure to the limit stated will not operate to reduce the power if the cylinders are proportioned for the pressure from which they are to be supplied with steam. The greatest power will be developed under those conditions which permit the highest economy in operation. Since it is proven that a single-expansion locomotive is ordinarily more efficient at a pressure of 180 lbs. than when operated under higher pressure, it follows that at this pressure it may be worked to a higher power than can be obtained if served with any other pressure whatsoever. Finally, in this connection, due emphasis should be given the fact that the selection of 160 to 180 lbs. as running pressure of the locomotive is not to be regarded as a backward step. The problem in design is to increase the efficiency and power of the proposed locomotive as compared with those previously built and if it is shown that a reduction of pressure is a means to such an end, real progress is to be achieved by using the lower pressure.

## THE NEW HAVEN'S ELECTRIC EXPANSION.

With the acquisition, long heralded and soon to be announced officially, of the Connecticut Railway & Lighting Company's property and of the Rhode Island Company's street railway lines, President Mellen's swift electric campaign closes by the law of territorial limitation. Here and there, probably in southeastern Massachusetts, there may be hereafter a short line bought in; there will be in places extensions of existing lines, and there will be double-tracking of urban lines and other improvements. But, to all serious intents and purposes, electrical extension as a broad and insistent policy closes now that Mr. Mellen has obtained an electric monopoly coincident in area with that of his steam road and a standing bar to long distance competition. The menace of that rivalry has not been very grave in Connecticut since the steam road took in the New Haven and the Hartford street railway systems. But in Rhode Island, especially between Providence and Boston and the nearby cities, the peril has been very serious indeed. In that quarter, hitherto undefended, the New Haven is now firmly and impregnably fortified.

The electric system which the New Haven now holds, in contrast with the three street railways with but 50 or 60 miles of track owned by the corporation when Mr. Mellen became head of it three years ago, deserves attention for its sheer magnitude. The wheels within wheels of the system in Rhode Island, with its multiplied holding companies, prevent accurate and full statement. But, in round figures, the whole system in three states includes some 1,350 miles of electric line; gross earnings of $15,000,000 or more a year; and stock, bonds and floating debt, including securities of the various holding companies, which at market values would probably, in a conservative estimate, capitalize up to at least $130,000,000. It covers all but one of the 18 cities of Connecticut, the centers of population in Rhode Island and, in Massachusetts, Worcester, Springfield and Pittsfield. Purchases of street railways by other steam railroad companies in this country, considerable as they are, become almost trivial in comparison. And, as a mighty step in determining the relations in the carrying trade of steam and electricity, the Mellen policy must be regarded as epoch-making. It involves, not far in the future, not merely physical questions in matters of operation but public and state relations of delicacy and importance.

Some of these may here be fitly pointed out: In taking up the Connecticut Railway & Lighting property the New Haven for the first time assumes the public service of light and power. Gas and electric lighting functions devolve upon the steam railroad corporation in several Connecticut cities as well as the operation of the great Housatonic lighting and power company with its long distance service. Here alone is a suggestive widening of the steam corporation's public relation and responsibility, the outcome of which will be instructive. Then again the new acquisitions have a noteworthy relation to the situation in Massachusetts, where the state policy of preventing purchase of electrics by steam railroads must beat against a great consolidated railway system in the two states below as well as the actual purchases by the New Haven within the state itself. Broader and deeper still is the problem of public service responsibility when over a great region of dense population steam and electric monopolies are thus combined. Turning from questions of public relation to those of physical operation and development they branch out in varied directions. What are to be the direct economies possible by centralized operation of the huge electric system, including wholesale contracts for material? What the opportunity for indirect economies by joint operation of electric and steam lines hitherto rivals? What the scope for development of freight and express traffic on lateral trolleys? And, finally, what the opportunity of testing and, in the event of initial success, expanding Mr. Mellen's favorite scheme of entraining local electric cars for interurban and long distance service on present steam lines?

The price paid by the New Haven's energetic and bold President for the protection of his corporation's property on the one hand and the opportunity to answer the foregoing queries on the other is a high one. Even with increased operating economies and with the growing receipts in gross and net which New England street railway companies generally return, several years must pass before the deficit of some hundreds of thousands of dollars between net receipts and purchase money fixed charges is finally wiped out—and that result presupposes in the country the persistence of the era of prosperity. Against this must be set with a high fiscal credit mark the collateral and protective vantages, the latter permanent. Not so gratifying to the New Haven is the fact that it must pay dividends on a huge volume of watered stock. Its amount in the Rhode Island purchase cannot be estimated owing to complexities of repeated capitalizations during the last few years and the fiscal intricacies of several holding corporations. But in the case of the Railway & Lighting Company the figures can be made more definite. That corporation six years ago with an addition of only two or three miles of new construction jumped its new stock capitalization to $15,000,000 and its bonded debt to $9,350,000. This was based on about 159 miles of track and three or four local gas plants—and the component trolley corporations had been previously and originally heavily watered in both stocks and bonds. At that time, notwithstanding considerable water, the 356 miles of electric railway of all the other lines in Connecticut, including the Hartford and the New Haven city systems, were capitalized at $8,137,048 in stock and $6,908,000 of bonded debt. By another test the Railway & Lighting Company, in its last return to the Connecticut Railroad Commission stands capitalized in stock and floating debt at $156,695 per mile. All this stock watering went through without the slightest protest or resistance from the languid and inefficient state commissioners. It now becomes a fixed charge on the steam corporation, an indirect fixed charge on the public and past hydraulics shift into hydrostatics.

The Belgian State Railroads now include all the important lines in the Kingdom, in 1904 the government working 2,506 miles, while only 365 miles were worked by corporations. No less than 44 per cent. of the State railroads were double track lines. They represented an investment at the average rate of $166,633 per mile, which is exceeded only in Great Britain, and is due largely to the heavy equipment, which was at the rate of 129 locomotives, 258 passenger cars and 3,131 freight cars per 100 miles of railroad (against 22 locomotives, 18.7 passenger cars and 797 freight cars in this country). The average capacity of freight cars there is not more than half the average here. The train service in Belgium was equivalent to a movement of 12.7 passenger and 9.4 freight trains each way daily over the entire mileage (against 2.8 passenger trains and 3.5 freight trains in this country. The travel in Belgium was equivalent to 1,034 passengers carried each way daily, against

143 here. The freight ton-mileage is not given in our authority. The earnings per passenger-train mile were but 63½ cents; per freight train mile they were $1.70½. Here the train-mile earnings were $1.14 for passenger and $2.43 for freight. Though the mileage of passenger trains in Belgium was 34 per cent. more than that of freight trains; the earnings were very nearly twice as great from freight as from passengers, and in all probability the passenger traffic yielded no net earnings whatever. The average receipt per passenger mile was 0.753 cent, the average for first-class passengers being 2.1 cent, and for third-class 0.608 cent; four-fifths of the travel was in third-class cars. Only 10⅔ per cent. of the tickets sold were simple one-way tickets; 33 per cent. were round-trip tickets, and 56 per cent. were various kinds of commutation or season tickets. Nearly two-fifths of all the journeys were made on "workmen's season tickets," at an average charge of 2.4 cents per journey. The State Railroads are heavily manned with an average of 26 employees per mile. The gross earnings were $17,873 per mile and $685 per employee. In the United States the average earnings were $9,306 per mile and $1,523 per employee, and the average yearly pay per employee was $631. The net earnings in Belgium were $7,238 per mile; in the United States, $2,998. The net earnings were 4.2 per cent. on the investment in Belgium.

## Mexican Central.

A preliminary statement made last week by the bankers interested officially announced the pending consolidation of the Mexican Central with the National Railroad of Mexico. Some such consummation had been for some time suggested by the activity of Mexican Central securities in the stock market. The National of Mexico is controlled by the Mexican government, and the consolidation of the Central with it means that the bulk of the railroad mileage of Mexico is to be controlled by the Federal government of that country. One of the accompanying maps shows the territory and extent of the Mexican Central; the other, not only of the National of Mexico, but of the International, the Interoceanic and the Hidalgo & North-eastern, which are also controlled by the government, as well. From these maps it will be observed that the Mexican Central and the Mexican National are parallel and competing lines for through traffic between the United States and Mexico City, the Central via the El Paso gateway, the National via Laredo, and also over the Mexican International, which it controls, via Eagle Pass. It is a striking contrast to see the Mexican government consolidating under its own control two parallel and competing lines at the same time that the United States government, having already forbidden such consolidation by law, is beginning an investigation of the Harriman Lines, in order to prove whether or not the Union Pacific and the Southern Pacific can, in reality, be considered parallel and competing lines. It is also to be observed that the taking over of the Mexican Central brings the government railroad system by two existing roads, and a third projected, to Tampico, the port of first importance in the international business of the Republic, but reached exclusively by the Mexican Central. It also places the government in command of the El Paso gateway, which is of about equal importance with Laredo in imports and exports. The government system on completion of the merger will amount to, not including the Tehuantepec National, 213 miles, in which it has a partnership interest, over 6,500 miles, made up as follows:


National Lines of Mexico.

| | |
|---|---|
| Mexican Central | 3,156 miles. |
| National of Mexico | 1,732 " |
| Mexican International | 882 " |
| Interoceanic of Mexico | 736 " |
| Hidalgo & North-Eastern | 153 " |
| Total | 6,658 miles. |

Of this, 426 miles of the National, all of the Interoceanic, and all of the Hidalgo road are 3-ft. gage, a total of 1,315 miles of narrow-gage line out of the total of 6,658 miles.

The consolidated company is to be known as the United National Railways of Mexico. It is to issue two classes of bonds, prior lien 50-year bonds and general mortgage 70-year bonds, each class bearing 4 per cent. interest. The general mortgage bonds, which have the second lien, are to be guaranteed by the government of Mexico. The official statement says that present net earnings of the Mexican Central and the Mexican National are sufficient to meet the interest on all the bonds proposed. It is hard to say how consolidation of the two properties will, in itself, have the effect of increasing their net earnings. In Mexico, railroads are allowed to pool their traffic, so that many of the disadvantages of keen competition can be done away with without consolidation. Potentially it will be a safeguard to have the two roads under one control. The merger, however, appears to be due to the aggressive policy of the Mexican government, which fears absentee ownership of the transportation facilities of the Republic. In fact, the Minister of Finance, through whom negotiations for taking over the Mexican Central were carried on, is reported to have said that the fear of absolute control of the principal Mexican lines by residents of the United States was the compelling cause of the transfer.

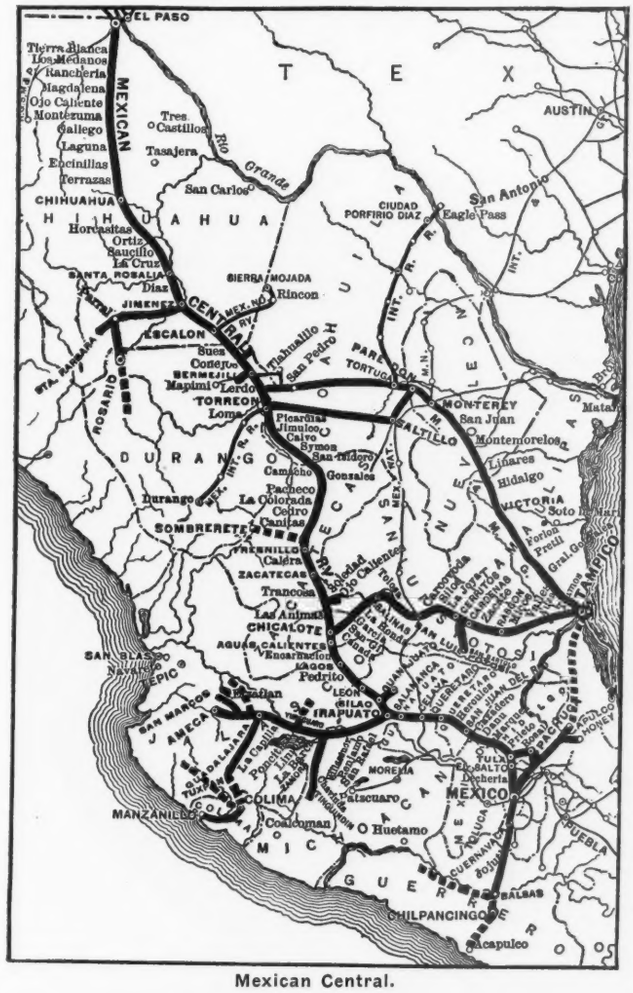
The Mexican Central is the largest railroad in Mexico. It has been greatly handicapped by its large capitalization. Even in the last fiscal year, when the prosperity of the country was rapidly increasing, although the road was not subject to the disastrous floods of the previous year and the currency reform act which went into effect May 1, 1905 was in operation the whole year, it was only after withdrawing $1,000,000 from the subsidy trust fund, representing the Mexican Government's subsidy payments on various parts of the road, that a net surplus for the year of $200,000 was obtained. In the fiscal year 1905, even after the help of $750,000 of the subsidy fund, there was a net deficit for the year of over $200,000, which was paid off from the income of the last fiscal year.

Yet the earnings were not unsatisfactory. Gross earnings were $14,000,000, as against $13,000,000 in 1905. Per mile of road they were $4,497, an increase of $360 a mile, or 9 per cent. over 1905. Operating expense, however, was increased over $1,000,000, or 13 per cent., leaving only a trifling increase in net earnings. There is one unsatisfactory feature among the earnings, which is made clear in the detailed figures. Beginning with January 1, 1904, no charges were included in gross earnings for carrying construction material (company freight), an item of earnings which was as high as $237,726 in 1889 and $125,000 in 1903. Last year, $80,000 of the gross earnings were earnings on construction material, a return to an outgrown practice which belongs only to the days of speculative railroading.

Transportation and traffic expenses, which apparently represent conducting transportation, increased 13 per cent. There is no accurate way to compare this with the increase in amount of business done, as no figures of passenger- or ton-mileage are given. Maintenance of way increased 8 per cent. and maintenance of equipment 22 per cent. The unit figures show the maintenance charges more clearly; maintenance of way per mile cost $514 against $477 in 1905. These represent insufficient amounts on any 3,000-mile rail-

road in the United States or Canada. The low figures are due, in part, to the cheap labor obtainable for roadway work in Mexico, but, even taking this fact into consideration, seem small. Maintenance of equipment repairs cost $2,360 per locomotive against $1,862 in 1905, $583 per passenger car against $427 in 1905, and $93 per freight car against $91 in 1905. The increase in the locomotive figure is said to be due to the heavy repairs necessary in changing locomotives from coal burners to oil burners.

The report is most incomplete in traffic statistics, as was last year's. A statement of exports and imports via the various seaports and gateways of Mexico, although it does not include figures for the year ended June 30, 1906, which have not yet been compiled, shows a surprising decrease in exports via the Mexican Central's gateway of El Paso in the year ended June 30, 1905. While exports via Eagle Pass (Mexico International) increased from a value of $5,400,000 to $5,800,000, and via Laredo (Mexican National) from $9,300,000 to $10,900,000 in 1905, exports via El Paso decreased from $15,500,000 in 1904 to $9,500,000 in 1905, a loss of 38 per cent. The only traffic figures which are given for the past year show that of the total freight traffic—whether this means tonnage or earnings is not stated—forest products made up 10 per cent., agricultural products 21 per cent., merchandise and miscellaneous 10 per cent., ores 28 per cent., and other mineral products 27 per cent.




Mexican Central.

Through the Mexican Pacific Railway, a subsidiary company, the Mexican Central is building the first through line to the west coast of Mexico. The Mexican Central's present line ends at Tuxpan. From Colima, 40 miles southeast, a narrow gage line, which was acquired last year from the Mexican National Construction Company, runs to Manzanillo, on the Pacific coast. The 40-mile connecting line from Tuxpan to Colima and the widening of the narrow gage line to standard gage is now under way. Much grading has been done and a good deal of work on the bridges. There have been serious delays on account of lack of labor; 1,000 Japanese laborers have now been hired in addition to those already employed. A wharf has been built at Manzanillo, 490 ft. long and 73 ft. wide, and a new town site has been laid out near the ocean about two miles south. The harbor of Manzanillo is now being improved by the Mexican Government. The Mexican Central expects to secure a large tonnage of west coast business and oriental traffic by way of this port.

On October 5, 1905, the Coahuila & Pacific Railroad, 200 miles long and extending from Torreon, on the Mexican Central's main line, east to Saltillo, was acquired at judicial sale. The mileage of this company has not been included in the accounts of the year pending execution of an agreement with the National of Mexico for joint operation. This road parallels part of the Monterey division of the Mexican Central. In order to connect it with that line at each end a 47-mile road from Saltillo north to Paredon, on the Monterey division, has been built. This was opened for traffic September 2, 1906. Of the $693,605 charged to income during the year for betterments and improvements, $288,697 was spent in ballasting and improving the Monterey division.

Surveys are still being made for a line to connect the city of Mexico with Tampico direct, by which the distance between these cities will be reduced from 778 miles, the present rail mileage, to about 278 miles.

There have been 50 locomotives already equipped to burn fuel oil and 200 more are now being converted. All locomotives are to be changed to oil burners as soon as possible, and all new locomotives ordered are to be oil burners. The Mexican Central's experience shows that the use of fuel oil saves about $4,200 a year on each locomotive as compared with cost of coal. As the increase in the cost of fuel, due to increased engine mileage and the high price of coal, accounts for one-third of the increased operating expenses of the year, it is easy to see that this is an important item in the economy of operation. Fuel oil is obtained at a point on the San Luis division, 35 miles west of Tampico.

The principal results of operation are summed up in the following table, in which for all figures previous to the net earnings, results in Mexican currency are transferred to United States currency at the rate of 50 cents for the Mexican dollar. The net earnings and following figures are converted at the rate of 49.75 cents for the Mexican dollar:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 3,156 | 3,155 |
| Passenger earnings | $12,650,011 | $12,265,231 |
| Freight earnings | 10,788,448 | 10,119,106 |
| Gross earnings | 14,188,403 | 13,048,850 |
| Maint. way and structures | 1,622,939 | 1,504,396 |
| Maint. of equipment | 2,031,697 | 1,654,860 |
| Transp. and traffic exp. | 5,526,622 | 4,896,924 |
| Operating expenses | 9,905,322 | 8,799,588 |
| Net earnings | 4,287,862 | 4,118,173 |
| Withdrawn, subsidy trust funds | 1,000,000 | 750,000 |
| Total income | 5,476,955 | 5,008,848 |
| Net income | 903,676 | 59,800 |
| Betterments and improvem'ts* | 695,546 | 270,510 |
| Year's surplus | 208,130 | †210,710 |

*Charged to income.
†Deficit.

## Western Maryland.

The Western Maryland was incorporated in Maryland on May 27, 1852, under its original name of the Baltimore, Carroll & Frederick, which was subsequently changed to the present name. The operations of the company during the first 50 years of its existence were restricted to a small local territory in Maryland and southeastern Pennsylvania. The city of Baltimore was anxious to extend its influence as a commercial center through the road and at one time or another gave it aid to the amount of about $9,000,000. Washington County, Maryland, in which is Williamsport, the terminus of the original line, also helped the road. Up to some five years ago both the city and the county held an interest in its securities. In June, 1902, the city of Baltimore sold its interest to a syndicate which had previously bought Washington County's interest, and the West Virginia Central & Pittsburg, a road with 100 miles of main track, 100 miles of branches and control of large coal areas in northeastern West Virginia. The eastern terminus of this road was Cumberland, some 60 miles west of Cherry Run, the western terminus of the Western Maryland. The syndicate which bought control of the two roads proved to represent the Goulds. The new owners at once began the unification and improvement of the property, as a result of which already the road has become of more than local importance and has still larger possibilities for the future.

In 1902 the road did not have satisfactory freight terminal facilities at Baltimore. The first move of the new owners was to secure a satisfactory tidewater terminal, for which surveys were begun in May, 1902. The new line, which amounts to a belt line around the west and south sides of the city of Baltimore, together with the freight piers, was opened for business in September, 1904, and the coal pier in February, 1905. This gave a modern and efficient freight terminal at tidewater.

The next step in the development was the building of a line to connect the Western Maryland with the West Virginia Central & Pittsburg, between which there was a gap of about 60 miles through heavy country along the Potomac river. This connection was opened early in 1906, so that the present year marks the uniting of the two parts of the road. The West Virginia Central & Pittsburg meanwhile has been entirely absorbed into the Western Maryland. Thus the road now consists of a main line 293 miles long

from coal fields in West Virginia east to tidewater at Baltimore, with 250 miles of other lines.

This is considering the road only in its individual aspect—a coal carrier of West Virginia coal to tidewater. It must always be remembered that besides this the road is designed to take its place sooner or later as the outlet on the Atlantic of the Gould system. There is a gap of something over 100 miles between it and the Wheeling & Lake Erie at Wheeling and also between the Western Maryland and the Wabash Pittsburg Terminal at Pittsburg. Work is already being done in a quiet way on a projected railroad called the Uniontown & Wheeling Short Line, which, if built according to its proposed route, would connect the Wheeling & Lake Erie near Wheeling with the Western Maryland near Cumberland. Whether it will ever be possible for the Goulds to build a direct connection between the present terminus of the Wabash lines at Pittsburg and Cumberland is doubtful. Although the air line distance between these two points is small the country is most difficult for railroad building, especially as the available routes are already taken possession of by the Baltimore & Ohio, Pennsylvania and Pittsburg & Lake Erie. By the southern and more roundabout route, however, there is likely to be in operation a through Gould connection to Atlantic tidewater within a few years.

During the recent constructive or formative period of the road, annual reports have not been published. The present report, besides containing figures for the last fiscal year, reviews a period of nearly five years, in which are three and one-half months initial and partial operation of the connecting line between the two formerly separated parts of the property. Including this much operation of the unified system, gross earnings for the fiscal year ended June 30, 1906, were $4,800,900, against $3,900,000 in 1905, an increase of about 20 per cent., net earnings were $1,696,000, also a gain of over 20 per cent. Net earnings of the coal and other departments increased from $428,000 to $720,000, while fixed charges rose from $1,671,000 in 1905 to $2,247,000 in 1906, an increase of $575,979. The net income for the year was $251,000, or 1.6 per cent. on the $15,685,400 capital stock outstanding. It is interesting to compare this figure of net income with other recent years in order to show the effect of the large new construction in temporarily reducing profits. Net income after charges in 1905 were $206,000; in 1904, $400,000, and in 1903, $990,000.

Although there has been an increase of over 50 miles in the operated mileage during the year, the cost of maintenance of way shows only a slight increase, which, on a mileage basis, amounts to a decrease, the figures being $920 per mile for this account in 1906 against $981 in 1905. If the road is to become a large carrier of bituminous coal this standard of maintenance will have to be considerably raised. Under maintenance of equipment, repairs and renewals cost $1,365 per locomotive against $1,211 in 1905, $46 per freight car against $43 in 1905 and $319 per passenger car in both years. The charge for passenger car repairs is much below the general average of other roads. It is, therefore, fair to conclude that it is too low, for, leaving out of consideration equipment on special limited trains, the cost of maintaining a passenger car varies little.

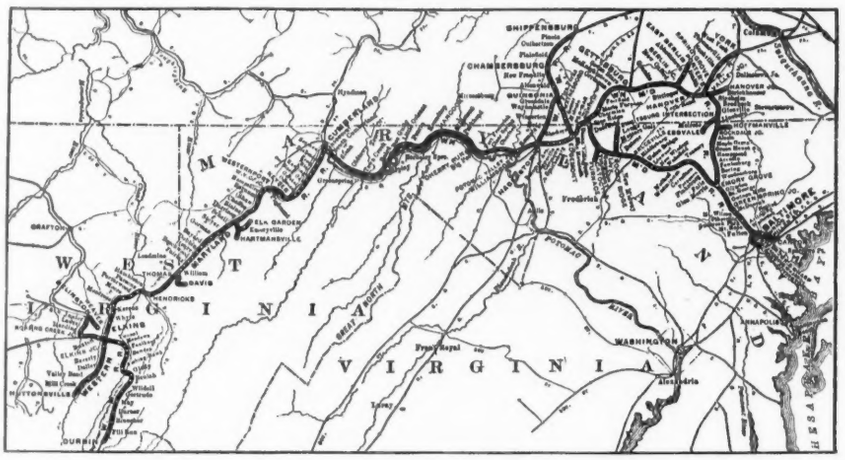
There was an increase of over 4,000,000 passenger miles and 135,000,000 ton miles. Freight earnings per mile of road increased from $5,740 to $7,134, or nearly 25 per cent., these figures being computed on the basis of 507 miles in 1906 and 478 miles in 1905. The trainload, which is not given in the report, was 355 tons against 329 tons in 1905.

Bituminous coal made up 49 per cent. of the tonnage in 1906, against 52 per cent. in 1905. The "products of mines" classification included 66 per cent. of the total tonnage carried last year. Forest products made up 15.5 per cent., manufactures 8.6 per cent., general merchandise 6 per cent., agricultural products 2.8 per cent. and animal products a little over 1 per cent. There was a large increase in tonnage of cement, brick and lime carried, which rose from 162,000 tons to 244,000 tons.

The Cherry Run-Cumberland extension is described in some detail. Work was begun August 1, 1903, and the track connected February 6, 1906. Freight service was begun a little over a month later, and on June 17, 1906, passenger service over the new line was begun. Of the 59 miles of this extension, 37 miles are tangent and 22 miles curve. The maximum grades are 26.4 ft. to the mile westbound and 15.8 ft. eastbound; the maximum curve is 6 degrees. The line is laid with 90-lb. rails, has five tunnels with a total length of 10,142 ft. and 23 steel bridges with a total length of 8,014 ft. The passing sidings average 3,000 ft. long and the average distance between them is five miles. The line is single track, but was built for economical operation of a heavy traffic. The work was difficult because the line crosses and recrosses the Potomac river at points where there are high rock cliffs on each side of the stream.

There are two pieces of important main line reconstruction started in August, 1905, which are now well advanced. The first is the rebuilding of the line from Fulton Junction, just out of Baltimore, into Emory Grove, the junction of the main line with the line running north to York, Pa. Grades and alinement are being improved on this 17-miles trip, and a double track is being built. A second similar betterment is being made to the lines from Williamsport (Potomac Valley Junction) to Cherry Run (Big Pool), 13 miles. Surveys between Arlington, five miles out of Baltimore, and Williamsport, 93 miles, have shown the possibility of getting a low grade line with a maximum grade of 21 ft. to the mile eastbound and 42 ft. westbound, and between Williamsport and Big Pool, a grade of 16 ft. eastbound and 26 ft. westbound, which latter rates are the same as those of the new Cumberland extension immediately adjoining on the west. The reconstruction of the two sections already mentioned is being made with a view to fitting into this low grade line. The need for the improvement is great, for on the section from Baltimore to Emory Grove, at times 50 to 60 trains daily are handled on a single track line with all the difficulties usually resulting from congestion in approaching and departing from terminals in a large city.

The section from Williamsport to Big Pool carries the company's heaviest freight traffic. On this line were nine large old wooden trestles unsafe for any but the lightest motive power equipment, two of the three steel bridges were insufficient and the rail was light and nearly worn out. The grades were 42 ft. to the mile eastbound and 55 ft. westbound, requiring the use of helper engines. It was necessary either to double track the line to provide for the double train movement caused by the helper engine service or to do away with the necessity for this service. The latter plan was decided on.




Western Maryland.

As the existing traffic does not justify carrying out yet the whole plan for the low grade line, instead of beginning work on the remaining portion from Emory Grove to Williamsport, 73 miles, the line from Emory Grove to Highfield via Gettysburg is being improved, thus forming an alternate route with the main line between those points. This, although considerably longer, has better grades than the main line. The improvement of the physical condition of the road may be judged from the fact that there were 93 miles of 90-lb. rail laid last year against 29 miles in 1905.

The coal properties of the Western Maryland include 107,000 acres in Mineral, Grant and Tucker Counties, W. Va., and Garrett and Allegany Counties, Md., 3,000 acres in Barbour County, 3,000 acres in Taylor County, 3,400 acres in Marion County and 2,500 acres in Marion and Monongalia Counties, West Virginia. They are controlled by the Davis Coal & Coke Company, which is operated as a separate subsidiary company. Last year this company produced nearly 2,000,000 tons of coal and 312,000 tons of coke. Net profits of its coal department were $500,000, which, with earnings of the real estate and store departments, made total net earnings of the company $720,000, against $428,000 in 1905.

The operating results of the consolidated Western Maryland Railroad are summed up in the following table:

| | 1906. | 1905. |
|---|---|---|
| Mileage worked | 544 | 487 |
| Passenger earnings | $876,426 | $795,220 |
| Freight earnings | 3,606,087 | 2,738,569 |
| Gross earnings | 4,802,094 | 3,900,249 |
| Maint. way and structures | 497,478 | 479,880 |
| Maint. of equipment | 595,371 | 446,251 |
| Conducting transportation. | 1,761,933 | 1,387,147 |
| Operating expenses | 2,995,611 | 2,416,571 |
| Net earnings. | 1,806,483 | 1,483,678 |
| Net income—all departments. | 251,509 | 206,097 |

## NEW PUBLICATIONS.

*The Steel Square as a Calculating Machine.* By Albert Fair. New York: The Industrial Publication Co. 81 pages; 5 in. x 7½ in.; 27 illustrations. Price, 50 cents; cloth.

It is difficult to determine from this book whether the chief aim of the author is to tell the ordinary mechanic, who has not had the advantage of a technical training, how to perform simple calculations by means of the steel square, or whether it is the belittlement of another author who has written upon the same subject. The greater portion of the first chapter is taken up with repeated attacks upon this unfortunate, and his ignorance and the absurdity of his attempting to handle the topic is brought out in the strongest light. All of which might far better have been omitted. This aside, the book is simply a citation of a number of cases that can be solved with a steel square that would ordinarily be worked out by the rule-of-three. There are also a number of examples illustrative of the application of the properties of the squares of the sides of a right-angled triangle, in which the square of the hypothenuse is equal to the sum of the squares of the other two sides. In addition to this the rule-of-three is given a large number of cases based upon the general proposition that homologous sides of similar triangles are proportional to each other; and this is followed by a description of the rulings on the several squares that are upon the market. For its suggestiveness to the mechanic who has not received a training in geometry the book will be valuable.

*Historic Locomotives.* Contains 10 full-page colored illustrations of old British locomotives, accomapnied by descriptive matter. Pamphlet form, 9 in. x 13 in. $1.00, paper. $1.50, cloth. The Derry-Collard Co., 109 Liberty St., New York, American representatives.

This interesting pamphlet, published in England by Alfred R. Bennett, M.I.E.E., and illustrated with colored plates from original drawings by Ernest W. Twining, gives some important bits of English railroad history, written in a popular manner, and also describes a number of famous accidents in which the locomotives described, or their prototypes, took part. The pictures are suitable for framing.

# CONTRIBUTIONS

### Semaphore Indication Above the Horizontal.

New York, Dec. 14, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the recent conclusions of the Railway Signal Association relative to the indication of safety above the horizontal line, the writer has for many years favored the raising of the semaphore arm above the horizontal for the clear indication. The reasons for doing so seemed obvious. This suggestion was deemed radical only three years ago, though now there seems to be a direct reversal of opinion.

In your issue of July 10, 1903, I called attention to what seemed to me to be a costly and dangerous practice in English and American signal practice in giving the clear signal indication. I quote from that article: "If Sir Charles H. Gregory had designed his signal to indicate safety by raising the arm above the horizontal plane instead of lowering it he would have saved a great capital outlay for the railroads. Reference has been made to the present practice on steam roads of indicating safety by the position of the arm below the horizontal, and the writer is of the opinion that in the beginning of signaling on electric lines careful consideration should be given to the position of the signal for indicating safety and danger."

Your editorial comment on my radical suggestion was most conservative, indicating an inclination to put aside the question as of no consequence. I quote from your notes: "The recommendation to incline the semaphore arm upward to indicate go ahead will be received with interest, but probably with conservatism."

More signals have been placed since I made this recommendation than in the ten years preceding, and it will cost a vast amount to change, and probably accidents will occur during the transition period. Is it not better then to discuss and discover the facts concerning radical suggestions rather than make a feeble editorial comment consigning the matter to conservatism. We should not have fallen into this dangerous and costly error in signaling had we not blindly followed English practice. And, indeed, some of the English roads acknowledged the danger of using the clear position below the horizontal; but instead of dealing with the matter boldly they pivoted the semaphore in the middle and let it go at that.

I consider the decision of the signal engineers in favor of giving the clear position above the horizontal to be the most important step ever made toward safe railroad operation. I venture again into the future by recommending the careful study of automatic control of trains. Of course this is now done to a limited extent here, but in no case on regular surface roads. We must guard against the involuntary acts of man.

CHARLES HANSEL,
M. Am. Soc. C. E.

### Why Freight Cars Don't Move.

Champaign, Ill., Dec. 15, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

One of the leading problems confronting the traffic manager and the superintendent to-day is the scarcity and low average daily movement of cars. Statistics show that a freight car travels about 25 miles in 24 hours. Now we know from actual experience that loaded freight cars are moved while they are in transit, with very few exceptions, at a speed of not less than 20 miles an hour and sometimes even as high as 40. However, an average speed of 15 miles an hour is most economical. But to go back to the original proposition, if a car runs over 20 miles of track in one hour it will cover 25 miles in one and one-quarter hours. Then what is this car doing the other 22¾ hours of the 24? It is evidently standing still or being switched or running empty. A portion of each of the above three items is unavoidable.

One official states that he can see no means of improvement under present conditions, and suggests more unloading tracks at terminals. Another calls for more cars and engines. The plan which suggests itself to me, situated as I am at the "seat of war," is more systematic work on the part of the three most important subordinate officials, without whose intelligent and earnest co-operation the work of the most exacting and energetic manager must fail. They are roundhouse foreman, trainmaster and traveling engineer. To bring this about there should be better inspection, lubrication and light repair work of locomotives and cars before each trip over a district. A "break down" on one engine or one car will delay the whole train. A large number of disastrous derailment wrecks can be traced to careless or indifferent work on the part of inspectors. Careful work by inspectors will also diminish terminal delay and the attendant delay on other trains in consequence of the same. Have all employees connected in any way with the movement of a train perform their duties strictly on schedule time. Put engines through the house for return trip as quickly as possible. Discover a way to eliminate extraordinary delays between terminals. Do not allow switch engines to delay trains or road engines at any time.

It takes time and money to stop and start a modern heavy train and the pulling out of a drawbar in the performance is no uncommon occurrence. This is also the cause of a big loss in daily car movement. An increase in hourly mileage can be made by employing a different system to-day from that which was used ten years ago. Weed out the chronic kickers and disagreeable men. They cost the company a large sum in a year. Successful car movement can only be accomplished by careful, painstaking work by those who are on the field of action, and in a position to watch and note every move that is made. This supervision cannot be accomplished over long distance telephone. Many roads are still trying to operate trains, yards, terminals and machinery on the same plan as of a decade ago, notwithstanding the fact that each particular unit entering into or concerned in this operation has more than doubled in size and importance. In order to overcome this there should be assistants to the superintendent of transportation with practical experience enabling them to detect weak points in operation, and they should also have a technical knowledge of the construction of rolling stock from which they would be able to locate the numerous small defects which if let go unheeded will ultimately lead to a derangement of the smooth working of the entire system. These men then could detect the apparently insignificant things which impair the efficiency of the system. Railroad employees, as a class, while doing the great bulk of their work conscientiously and well, are prone to slight the little things unless closely watched by a superior. These so-called trivial things or circumstances are too numerous to list, but are known to the practical man by intuition and actual acquaintance. Some are caused by the application of a false theory to construction or operation. The great majority, however, are the result of careless or indifferent work and the tendency to stay in a rut after once getting there.

With attention to business and up-to-date work on the part of the three subordinate officials referred to there is no reason why the car movement mileage per hour cannot be increased without additional expense or facilities. More cars would not help when those already in service are getting such poor movement. Additional unloading tracks would help but are exceedingly hard to obtain in the large terminals. There is not a district on any system in the country on which delay in car movement cannot be eliminated to a very perceptible degree by better and closer supervision and inspection by those in authority.

JAMES A. GREEN,
Locomotive Engineer.

[The weaknesses of the train service here recounted do, in-

deed, constitute one of the causes of the widespread inefficiency now everywhere complained of, and we are glad to have a competent observer describe them; but our correspondent must not make his fellow workers in the train service too prominent in this unpleasant notoriety. The chief sinners are the men who are responsible for the use of cars as storehouses and for their unauthorized use on other than the owner's road.—Editor.]

## The Strike of Railroad Clerks in Louisiana and Texas.

Galveston, Harrisburg & San Antonio Railway Company,
Houston, Texas, Dec. 13, 1906.

To the Editor of the Railroad Gazette:

In your issue of December 7, on page 510, I notice what is said about the strike of the railroad clerks. I am somewhat at a loss to know from whence you derived the information contained in the statement, as a great deal of it is incorrect. The facts briefly are as follows:

A committee purporting to represent the railroad clerks in the employ of these [Southern Pacific] companies met in Houston early in October and addressed a communication to me, stating that they desired to have an interview in order to make an agreement with the companies, for their organization, etc. A courteous reply was returned to the committee, advising them that they should properly take up the subject first with their local officers, as they alone were familiar with the details and the requirements of the clerks' duties, and naturally were the officers to first pass upon the justice of the demands. Instead of acting on this advice a communication was received by me from the president of the organization, in which the ultimatum was given that unless I agreed to meet these clerks and discuss the matters with them at a certain hour two days later, he would put the matter up to the men for action. The hour set was noon on October 12th. I was away from headquarters when I received this communication, which reached me in the afternoon of October 12th, and naturally I could not have met the committee at the time arbitrarily set by this man even had I been so disposed. The next morning, Saturday, October 13th, at 10 o'clock, most of the clerks at New Orleans and Algiers and a few local points in Louisiana, employed in the local freight offices, and also a number of clerks employed principally in the yard offices and some in the freight offices at Houston and El Paso, discontinued work. We knew of their intentions a day previously, and inserted advertisements in all the newspapers and soon had the positions of the men who had quit work filled.

Your statement that all departments of the general offices were involved is not correct, as in the auditor's office at New Orleans five clerks left, and none left the auditing department in Houston. You state also that the strikers were orderly and that crowds gathered at Houston and that military protection was about to be extended to the road. This statement is entirely at variance with the facts, and no military protection was about to be extended to the road at any time. At Houston and other localities in Texas, however, we had most excellent police protection, which possibly prevented any trouble at these points. At New Orleans and Algiers numerous assaults have been made on non-union men, generally from 15 to 20 men attacking a single non-union man; but I am glad to say that within the past week or ten days the police there have taken these matters vigorously in hand and have put a stop to such cowardly assaults. In one case, a newspaper reported that two strikers jumped on a 15-year-old boy, who had just recovered from a spell of typhoid fever, and managed to beat the little fellow up.

There was at no time any necessity for this strike. These companies treat their men with absolute fairness and justice. As a matter of fact, the wages paid clerks on our lines are as good, and in many cases better than those paid by other lines in this territory; the hours of work are no longer, and the wages of railroad clerks, as a rule, are better than those paid by commercial houses in this section for similar services. The hours of work in the railroad service are generally much less, particularly at certain seasons of the year, than the hours of work in commercial houses. This strike was absolutely uncalled for, and the interests of the public were entirely ignored by the men who brought it about. Fortunately, however, the railroad companies were prepared for it, and outside of the malicious changing of tags on cars, loss or destruction of waybills, etc., the inconvenience experienced has been of small moment.

I must confess to considerable surprise in reading your statement and at the exaggeration—presumably unconscious—which has lent undue importance and dignity to what was rather a small affair. Instead of 800 men, as quoted in your article, going out, there were less than 300; many of the men refusing to follow the dictates of the agitators, who were really responsible for the entire trouble.

I am confident that the *Railroad Gazette* would not wilfully misstate conditions, and it is because of this feeling that I make this correction.

T. Fay,
[General Manager.]

## The Flagman on Block Signaled Railroads.

Union Pacific Railroad Company,
Omaha, Dec. 4, 1906.

To the Editor of the Railroad Gazette:

I have read with considerable interest your editorial of November 30 on the proposed abridgment of the present standard code flagging rules, as advocated by Mr. Slater, Signal Engineer of the Southern Pacific, every word of which is gospel. That this innovation on our present methods will, sooner or later, be accepted in practice by railroads that are block signaled is certain; and the sooner the better. How this dependence on the automatic signals can be brought about with safety is the problem which confronts those who favor the change.

To a marked extent enginemen become automatons. Their multitudinous duties require involuntary action and the performance of the duties in the order of their assumed importance. For instance, it occurs to an engineer to put on the injector, shut off the throttle and apply the air, whistle for a road crossing or station, call for the train order or block signal and answer its change in position. He would naturally commence the several duties in the order of their importance, as might be governed by the conditions at that time and place. At the same time he might, also, be deciding mentally whether it were going to be necessary at the coming stop to take coal or water, whether he had time enough to key up a rod or light his head-light, or perform some other duty that must be done at an opportune time. Many of the physical moves made by an engineer are apparently mechanical; much the same as one must learn to ride a bicycle—there is no time to telegraph the brain that the handle bar needs turning to avoid a fall; it must be done instinctively, as it were.

The locomotive engineer has been trained for years to look for the human being as his best admonitor of danger. The animation with which the flagging is done indicates, to a great extent, whether the air is to go into emergency or be simply a service application. The inanimate object has not, as yet, the power to jar him loose from a pre-conceived plan as to what he will do in the next few seconds or minutes. The engineer is, perhaps, no more the creature of habit than other men, but when, after a collision, we measure from the exploded torpedo to where he hit the caboose, carefully noting the amount of sand on the rail and take into consideration the grade; and determine as nearly as possible the velocity of the train, the inertia, amount of air pressure, etc., and then decide that, if there had been 50 ft. more distance in which to have stopped, the collision would not have occurred, do we take into consideration the shortness of the time at the maximum speed in which it would have been necessary to act? Very likely it proves to be only one second.

Let us look into some of the obstacles to be encountered in making a change from the present system of flagging, or, rather, its partial abolishment, placing reliance almost entirely on the automatic block signals. With the space interval greatly reduced the flagman must, under the proposed rule, use good judgment in figuring whether the block in the rear is not less than half a mile off, especially if the grade is descending, with a sharp curve. So long as he is within the rule it is, in his opinion, up to the other fellow (the approaching engineer) to make the stop successfully. The grievance committee will take care of him if he is within the law, and he is very apt to take a chance on that. The probability that a signal may be at clear with a train in the block is so remote under the modern mechanism of automatic signals that it can well nigh be eliminated; still the possibility of such a condition cannot be denied. Therefore, the position of the signal will be more or less a question of veracity between the flagman and the man or men on the head end of the following train, in case of collision, with the preponderance of the *testimony* against the signal and the flagman. It has been said that the "science of railroading is the art of shifting responsibility." The rank and file are no mean scholars in this science.

If a red lantern, a fusee and several torpedoes sometimes fail to stop a heedless or reckless engineer, to what extent will the fixed signal decrease the tendency to do some of the things that may be deemed simultaneously necessary before reaching over for the air? Will it indicate, with its cold stare, "emergency"? or will it say "service"? How is the problem affected by having the normal position stop; where the red is a familiar light along the route, until the preliminary section is passed, where it *ought* to change its color?

It is pretty generally agreed that our present flagging is crude, unreliable and a constant source of anxiety. It is practically worthless, without military precision and military drilling. The flagman, unlike the soldier, is not enlisted for a term of years, consequently at times he is poorly drilled. It is also difficult to keep irresponsible men out of the service. The "human equation" is not becoming any less perplexing; on the contrary that one time faithful, loyal, regard for duty that we read of is becoming less common; and it will continue to vanish as government surveillance asserts itself.

The sooner railroad officials make up their minds to substitute

the fixed signal for the flagman and set about the new line of training and discipline to accomplish it, the better it will be for those who have to do with railroads as patrons, managers or employees. That this is no easy task is apparent to those who are acquainted with the human machine who operates the train. It is especially difficult, at this time, with public sentiment, as it is at present, ready to condemn officials or employees for an accident, no matter how remote the responsibility may be. It is, therefore, not surprising that it requires more than the ordinary nerve to advocate a radical innovation of this kind, to say nothing of authorizing it.

The railroad first adopting the new flagging system, if without the endorsement of other roads, would be compelled to stand not only the criticism of the public in case of an accident, but that of the railroad profession at large, who would undoubtedly take such an opportunity to justify their adherence to the old methods. We can imagine the standing of a railroad that was before the bar of justice defending itself against a departure from the methods and standards of all other railroads, if the protection of the train was even indirectly connected with the affair. "Man's inhumanity to man" is proverbial, and is not lessened in the daily training of railroads. There is perhaps no vocation that so hardens the sympathies or so resembles its methods, except that of war. Many go down in battle who are not stricken by bullets; but they are as fatally wounded; blasted in hope, ambition and reputation.

If railroad officials will interest themselves in this matter, which has in it more than some seemingly greater problems, there will be a united movement forward that will never be regretted. There may be trouble which is out of the ordinary, but the final results will justify the step. If the change is left to one railroad to accomplish the move will receive a setback, in the first serious "tail end" collision, from which it will take an indefinite period to recover.

The Train Rule and Safety Appliance Committees of the American Railway Association now have the matter under consideration, and we wait with much interest their recommendation to the association.

W. L. PARK.

[The Editor is glad to hear that every word of the editorial on the flagging rule is "gospel," especially as another esteemed correspondent (see below) seems to think that a part of the article isn't. Defining gospel as "good news of salvation" the Editor must modestly admit that the second correspondent may be right; however sound the views presented, their fulfilment is probably some little distance in the future; too far to warrant the claim that anything has yet happened to cause rejoicing. But on one of the secondary definitions of the word—"any doctrine concerning human welfare that is agitated as of great importance"—we—again with modesty—accept the honor! The flagging-rule problem is a matter of great importance, as related to human welfare, and in the article referred to we set out to agitate it. Whether or not it is safe to adopt any change in practice before assurance can be had that the result will be 100 per cent. perfect we shall not attempt to say, offhand; though in some important railroad improvements we have *not* thus waited; for example, in using air-brakes on freight trains. Concerning the perfection of automatic signals, as related to this question, Mr. Slater has already spoken. As to making enginemen perfect, one useful means would be to stop trains five minutes at every automatic stop signal (if the signal should not clear within that time). Probably no one denies that that would help toward improvement, but—can it be that we do not want perfection so badly as that? Another good thing would be to apply "surprise checking" with vigor. We mean with much more vigor than it has ever yet been applied; though we hear great results have been accomplished, on a great eastern trunk line, by the application of these tests in the comparatively gentle way that on most roads seems to be regarded as satisfactory.]

## Abolition of the Flagman.

Chicago & Alton Railroad Co.,
Chicago, Dec. 5, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Is not your editorial of last week (page 471) on the question of the abolition of the flagman rather too radical? I think you have not given sufficient consideration to the fact that a double-track road signaled with automatic signals is merely operating under permissive blocking. Permissive blocking always means that you have got to depend upon the engineer's judgment as to what is a safe speed in an occupied block.

The engineer in nine hundred and ninety-nine out of a thousand cases finds that the preceding train which stopped him has gone forward and he never sees it. Under these circumstances, and especially in the case of a fast and important train, he is quite apt to misjudge the speed at which he is moving. Then, if the preceding train stands in a dangerous spot around a blind curve, or at a summit, in neither of which cases can it be seen a great distance—and no flagman is back, what hope is there that the following train will not collide with it?

It seems to me that until signals are 100 per cent. correct in operation and enginemen are 100 per cent. perfect in obeying signals, flagmen are an absolutely necessary adjunct of the service.

C. A. GOODNOW.

## The Omaha Cut-Off of the Union Pacific.

The present line of the Union Pacific out of Omaha runs almost due south from the Union station for seven miles before swinging westward. The country immediately west of the city is rugged for prairie country, which explains selection of this route in the original location. It enabled the line to follow favorable water courses, as shown on the accompanying map (Fig. 1). A direct line was not an object of primary importance in the days when the Union Pacific was built, not only because of the necessity for having construction work and cost as light as possible, but because the Government land grant, which made possible the construction of the road, imposed no restrictions as to location of the line and the amount of land thus given was proportional to the mileage. From a point on the main track in the west part of Omaha known as the Summit, to Lane, a small station on the present line due west of Omaha, the

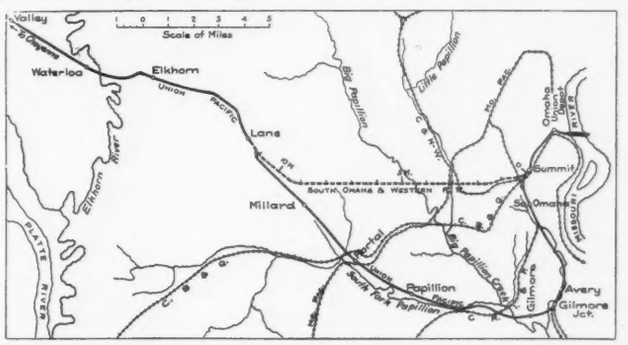



Fig. 1—Omaha Cut-off and Present Main Line of the Union Pacific.

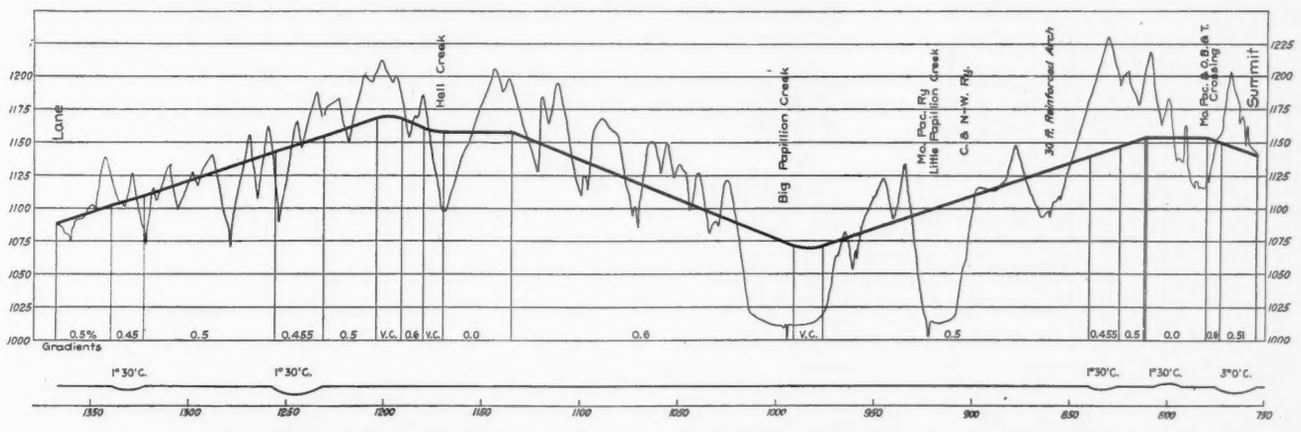



Fig. 2—Condensed Profile of South Omaha & Western Railroad; the Omaha Cut-off of the Union Pacific.

air line distance is 12 miles. By the railroad it is almost 21 miles. Therefore, the cutting out of this wide detour in the original location, with consequent large saving in distance, has become desirable under present traffic conditions. The work was undertaken early in the present year under the charter of a separate corporation known as the South Omaha & Western Railroad.

The country through which the new line runs is rugged and there is no topography favorable to a railroad. The surface is very rolling, the hills consisting of the material known geologically as "loess." The drainage runs from north to south, practically at right angles to the line, and there are no favorable water courses which the line can follow to secure lighter earthwork. With the exception of a few curves necessary to connect with the present main line near the Summit, also some curvature for connecting at the west end to the old line, the alinement is straight, running over hills and valleys regardless of topography. The length of the cut-off, which is being built as a double-track road, is 11.64 miles. The length of the present main line between connecting points is 20.58 miles, yielding a saving in distance of 8.94 miles. The maximum curvature in the new line is the same as that in the old—3 degrees. The total amount of curvature in the new line is 163 deg. 44 min. and in the old line 407 deg. 12 min., the saving therefore being 243 deg. 28 min. The maximum grade in the new line, eastbound, is 26.4 ft. and in the old line is 42.2 ft. per mile. Westbound maximum grades are 31.7 ft. and 41.7 ft., respectively.

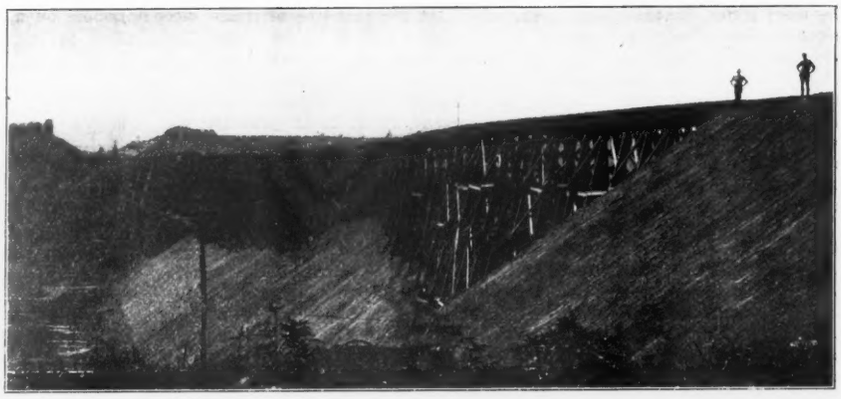


Fig. 3—Little Papillion Trestle Looking West; Showing Effects of Settling.

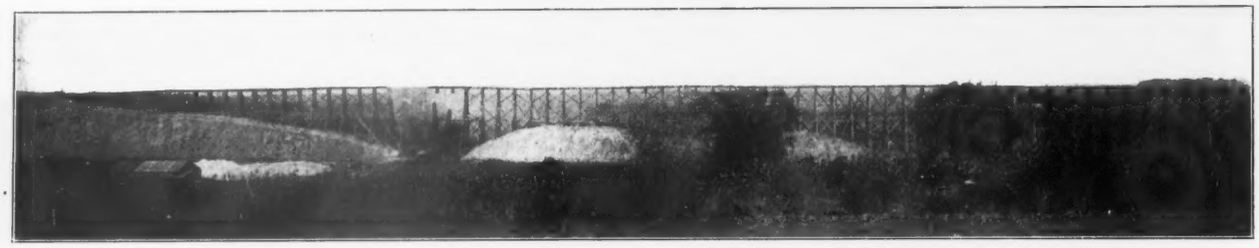


Fig. 5—Long Timber Trestle Over Valley of Big Papillion Creek; Highest Point 71 Feet.

Exceedingly heavy earthwork is being done in construction of the line. The estimated total is 2,888,000 cu. yds. of excavation and 4,000,000 cu. yds. of embankment. The heaviest cut is at the east and about a mile west of Summit, as may be seen by reference to the condensed profile shown herewith (Fig. 2). This cut is 86.7 ft. deep at the extreme depth, 394 ft. wide at the top and 5,200 ft. long. The total excavation required is estimated at 1,850,400 yards. The actual width required for this cut is 304 ft. at the top, but considerable material is being borrowed here for the heavy fills further west, which will increase the width to 394 ft.

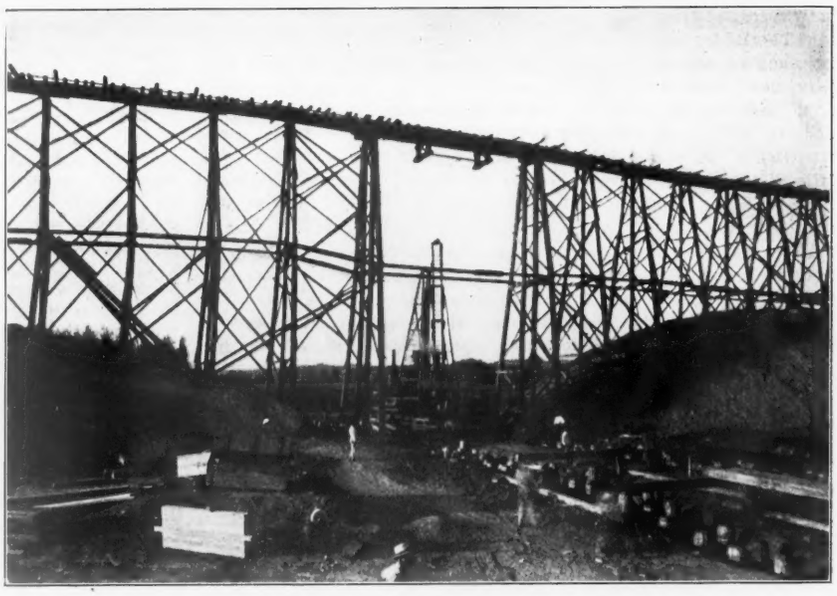


Fig.9—Driving 40- and 50-Ft. Piles for Foundation of Concrete Highway Arch Under 60-Ft. Embankment. Timber Trestle Over Valley of Big Papillion Shown at Extreme Height of 64 Feet.

Crossings of two principal water courses require heavy embankments. The larger of these 65 ft. high and 5,600 ft. long, is across the valley of Big Papillion creek. It will be 300 ft. wide on the bottom and will contain approximately 1,500,000 cu. yds. of earth. The highest fill, and next largest in size, is across the valley of the Little Papillion. It will be 89 ft. high, 3,100 ft. long and 420 ft. wide on the bottom. The original width for this embankment was 320 ft., but in the bottom of the valley is a deep alluvial deposit which is soft. The weight of the fill is displacing this soft material, causing it to bulge up on each side of the embankment as the latter settles. This will necessitate an increase in yardage of 400,000 to 500,000 cu. yds. and an increase in width at the bottom of 100 ft. Some idea of this condition is conveyed by one of the photographic views herewith (Fig. 3) in which the irregularity of the top of the temporary or filling trestle is plainly visible.

The temporary timber trestle across the valley of the Little Papillion (Fig. 4) is 96 ft. high above the bed of the stream and that across Big Papillion valley (Fig. 5) is 72 ft. high. The Missouri Pacific parallels the Little Papillion where the South Omaha

Fig. 7—Twenty-Ft. Concrete Arch for Highway Under 43-Ft. Fill in Valley of Hell Creek.

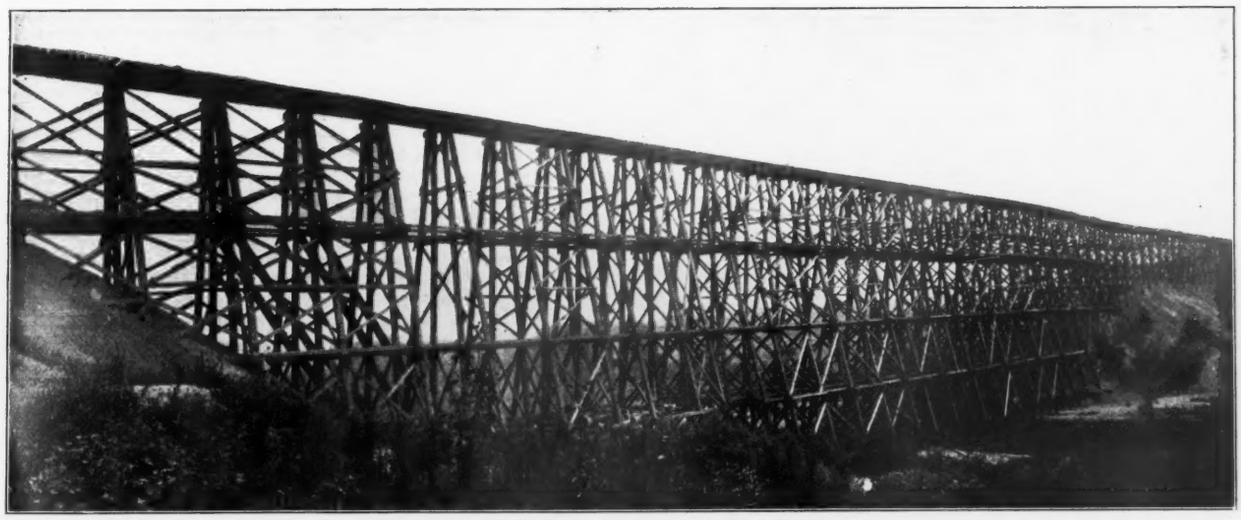


Fig. 4—Timber Trestle Across Valley of Little Papillion Creek, Looking East; Highest Point 96 Feet.

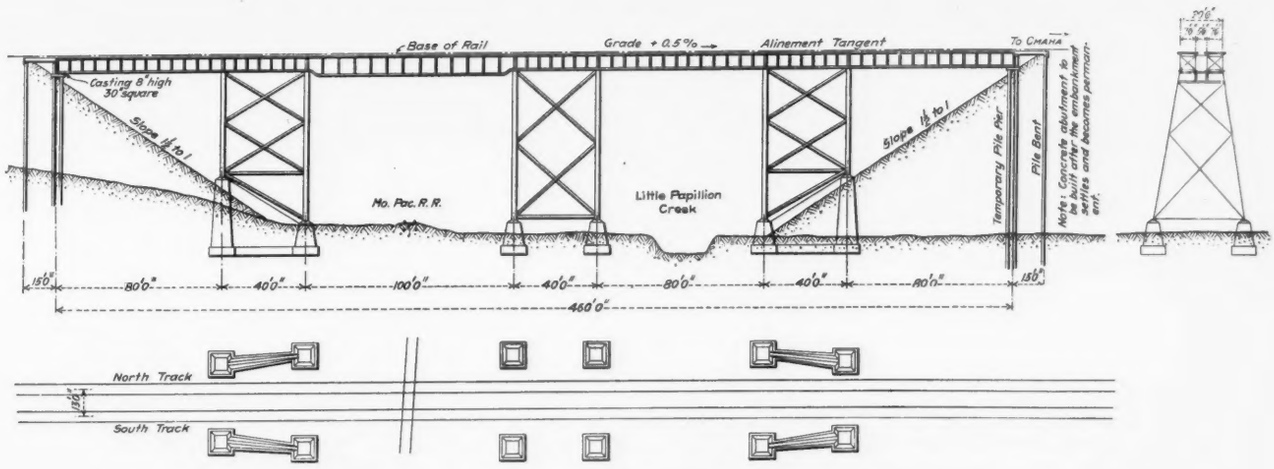



Fig. 6—Bridge Over Little Papillion Creek and Missouri Pacific Railway.

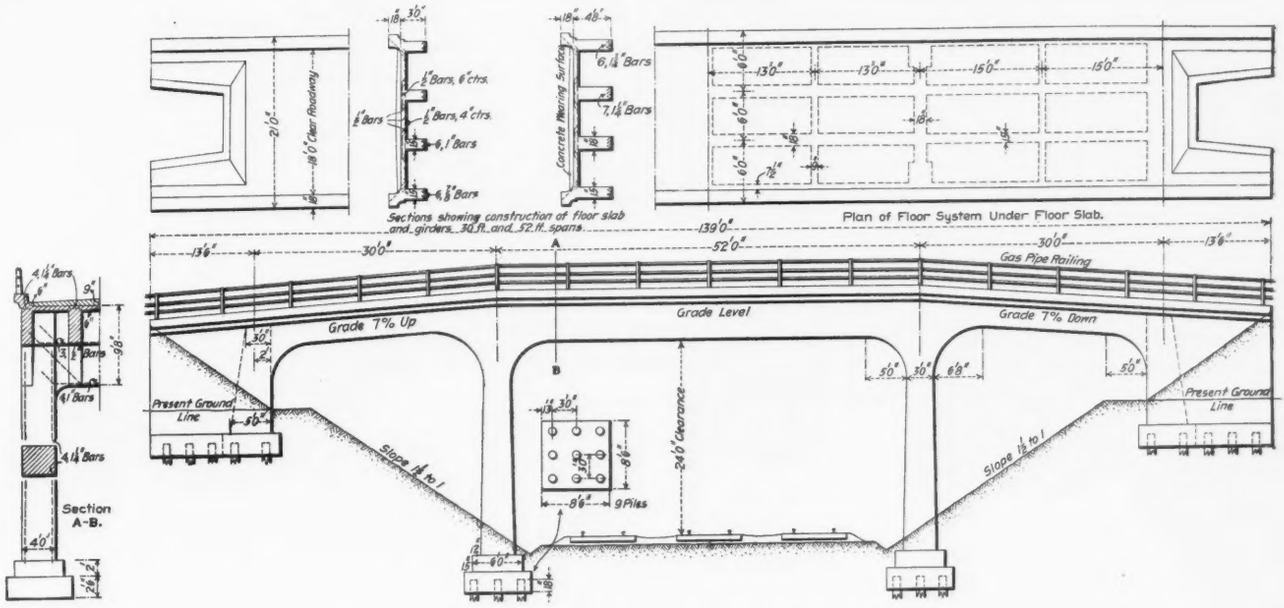



Fig. 8—Reinforced Concrete Highway Viaduct; Omaha Cut-off.

& Western crosses and the new line will go over the creek and railroad on a steel viaduct on concrete foundations, a plan and elevation of which are included in the illustrations (Fig. 6). It contains three 40-ft. tower spans and one 100-ft. and three 80-ft. intermediate deck plate-girder spans, the total length of the steel work being 460 feet. Its extreme height above stream bed will be the same as that of the timber trestle—96 ft.—and its construction will require 3,000 cu. yds. of excavation, 18,000 lineal ft. of piling, 4,000 cu. yds. of concrete and 800 tons of steel. Big Papillion creek will be crossed by a similar but shorter steel viaduct, with two 30-ft. towers, two 80-ft. spans and one 60-ft. intermediate span. The new line crosses the tracks of the Omaha Bridge & Terminal Railway (Illinois Central) and the Chicago & North-Western once each and the Missouri Pacific twice. All of these are overhead crossings by means of steel viaducts. The Omaha Bridge & Terminal line, which does not appear on the map, is parallel and adjacent to the branch of the Missouri Pacific at the point where the new line crosses it just west of Summit and a single structure will span the two. It will be on a 17½ deg. skew, and will consist of a double-track 105-ft. pony truss span and two double-track 80-ft. through plate-girder spans, the total length on center line being 266 ft. 9¾ inches. It will contain 460 tons of steel. The North-Western crossing will have a 138-ft. through riveted span and two 60-ft. deck plate-girder spans.

All other bridge and culvert work is of permanent construction, concrete or concrete and steel, except small drainage openings, which are cast-iron pipe. All streets and public highways will be carried overhead or underneath. Subways for highways below grade will be 20-ft. concrete arches where head-room permits. An arch of this kind is shown in Fig. 7, which is a highway arch in Hell creek valley under a 43-ft. fill. The barrel is 91 ft. long. Hell creek itself, 568 ft. west, is crossed by a similar arch, with a barrel 148 ft. long. The soft alluvial soil in these valleys made the building of this latter arch more than ordinarily difficult and also required certain modifications of design to meet the peculiar conditions. In the first place, in excavating, the material was too soft to handle with shovels and had to be sluiced out. Then because the weight of the embankment was likely to cause the material to bulge up between the footings, which were originally 10 ft. wide, they were extended across, forming a continuous footing. Reinforcement by means of corrugated bars was provided near the upper surface to take the stresses from the up-thrust resulting from the embankment pressure already referred to. There were about 24,000 lineal feet—over 4½ miles—of piling driven for foundation, both 40 ft. and 20 ft. lengths being used.

In cases where the embankment is too low for the 20-ft. arches, rectangular openings of I-beam and concrete construction, with a clear roadway of 18 ft. and a clear height above roadway of 14 ft., are being put in. This design of culvert on the Union Pacific was illustrated in the *Railroad Gazette* of Dec. 8, 1905. The line will cross one street in Omaha on a 30-ft. reinforced concrete arch. All other open streets of Omaha and South Omaha will be carried overhead with steel viaducts.

For two of the highway crossings reinforced concrete viaducts have been designed. In general character they are quite similar to the Big Four structures on the Hillsboro-Mitchell double-track short line of the St. Louis division, described and illustrated in the *Railroad Gazette* of May 18, 1906. However, the Union Pacific designs are much longer over all, one being 139 ft. and the other 160 ft., and the individual spans on both are much longer than the corresponding spans of the Big Four bridges. One of the Union Pacific viaducts spans two tracks, the central span being 40 ft. c. to c. of piers, the other spans three tracks with a central span of 52 ft. c. to c. of piers. Drawings of this latter structure are reproduced herewith (Fig. 8). In all cases where important structures are built in the valleys having the deep and soft alluvial deposits it has been found necessay to drive 40- and 50-ft. piling in the foundation pits to secure proper support, as in Fig. 9. On high ground the soil is firm and in some cases will support the masonry without piling.

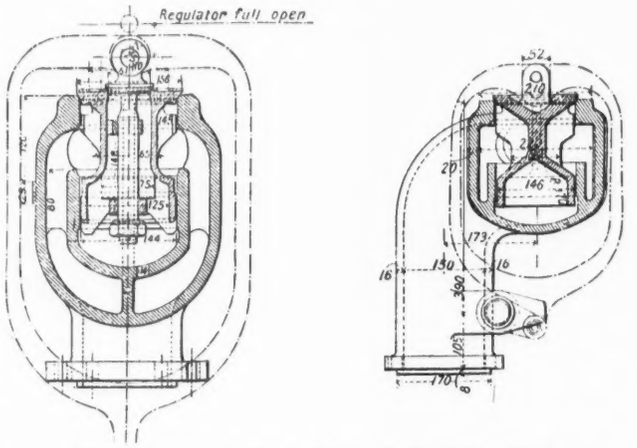
Grading is now about one-half and masonry bridge work more than three-quarters done. The work is being pushed as fast as possible. The present average working force is about 300 men and seven steam shovels, working day and night. There are engaged on the work 13 standard-gage locomotives, 12 narrow-gage locomotives, 72 standard-gage cars for hauling dirt, including flats and Lawson dump cars, and 128 narrow-gage cars. There are also two Lidgerwood unloaders, three pile-driver gangs, and four gangs putting in concrete or excavating for it. The line will probably be finished next summer.

It will be laid with 90-lb. rails, ballasted probably with Sherman gravel and equipped with automatic block signals. The old line is not to be abandoned, as there are several small towns on it and the local traffic, as well as its possibilities as an emergency line, will justify its maintenance.

The work is being done under the direction of Russel L. Huntley, Chief Engineer; J. H. Howe being Resident Engineer in charge. G. W. Sykes is Assistant Engineer in immediate charge of the work, with two field parties under him. The bridges were designed under James Keys, Engineer of Bridges. The contractors are Kilpatrick Brothers and Collins Contracting Company, Beatrice, Nebraska.

## Balanced Throttle Valve; Italian State Railways.

The *Engineer*, London, recently illustrated some compound locomotives built for the Adriatic System of the Italian State Railways, which embody some new features. Among these is a tri-phase throttle valve designed by Signor Zara. There are two forms as shown. It is of the ordinary cylindrical type, but with only one instead of two seats as the American pattern. Its purpose is to avoid the balanced or differential pressure on the two ends of the double-seated valve, which makes leakage possible and may allow the valve to be lifted without touching the throttle lever. With the balanced valve it is difficult to graduate the opening of the




Cross-Sections of Zara Balanced Throttle Valve.

valve when starting; for, as soon as the valve is lifted from the seat, the minimum opening which it is possible to give by hand to valves of this type, which are rarely less than 6 in. in diameter, corresponds to a considerable displacement of a flat valve, the port of which is often of triangular shape, to render the increase in sectional area gradual. There is also difficulty in fitting the double-seated valve on its two seatings. Because of the unequal expansion of the valve, as compared with the head in which the seats are machined, it is usual to shorten as much as possible the distance between the two seats, and by pouring the head and valve from the same melt to obtain like coefficients of expansion.

In the Zara valve the valve is a combination of a drop-seat valve with a piston valve, one above the other. The admission is

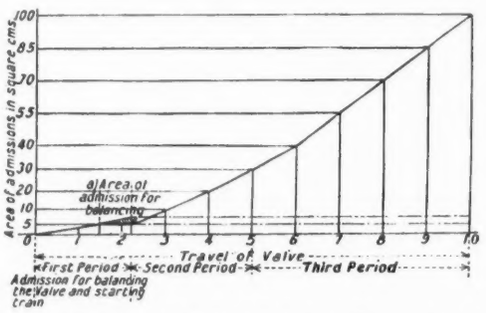



Diagram of Opening of Zara Balanced Throttle Valve.

from the top only, and the full boiler pressure bears against the single-beat valve. The first movement of the throttle lever operates a small valve which admits steam into a closed chamber below the sliding portion of the valve. This piston valve does not fit tightly, but an annular clearance is allowed by which an area is left through which the steam escapes in part to the dry-pipe and valve chests, the other part remains in the chamber to balance the pressure on the single-beat valve. This is the first period of the three-phase valve. The opening made is indicated in the diagram, and is set for starting a train without slipping. The limit of this period can be felt through the throttle handle when the stop on the small valve encounters the under side of the loose-fitting piston valve. Continuing the upward motion unseats the single-beat valve, as its cone extends down below the seat, the full sectional opening of the valve is not had until that cone is raised above the top of the seat. This is termed the second period; its purpose is to accelerate

slowly the speed of the pistons without slipping the wheels. When the valve is raised so that the lower side of the conical portion is level with the top of the seat, the third period is entered, and the action does not differ from that of ordinary balanced valves in the progressive increases of steam volumes admitted to the valve chest.

The small valve by which steam is admitted below the face of the main valve is either a small auxiliary flat valve, or a small valve formed by the vertical rod which lifts the valve, this rod being turned to form a small piston in a cylindrical part of the valve proper. In the compound locomotives built the flat valve was found to be simplest. About 230 locomotives have been fitted with this throttle valve, which, besides being steam-tight and having a gradual opening, is easily made and economical to maintain. It admits steam only at the highest point in the dry pipe, which in low domes is an advantage, and it is said to render unnecessary the employment of relief valves for the automatic discharge of water from the cylinders.

## University Education for Railroad Work.

The Dean of McGill University, Montreal, in the course of an address on "The Advantages of a University Education in Connection with Railroad Work," spoke as follows in regard to the views of prominent men as to the establishment of a railroad course at McGill:

John Carstensen, Vice-President of the New York Central & Hudson River Railroad, writes as follows:

"The great advantage to a young man of a university training is that it moulds his mind, and fits him to deal with affairs and men of affairs. As at present conducted, the education obtained in universities does not seem to produce men who, at first, are of as much value to the railroad service as the boy trained up gradually from the lowest to high positions, but subsequently it has been found that the university-trained man moves forward more rapidly on account of the wider breadth of view inculcated by his superior education, although he may not be able to deal with small details as the boy from the common schools."

Mr. Carstensen is strongly of the opinion that the university-trained men will be productive of the very best results. His company employs a large number of graduates, and he gave me many instances of their success, comparing their progress with the progress of those coming from the common school, and gradually working their way up from the office.

The Pennsylvania Railroad has always insisted on the employment of university-trained graduates in certain departments. They have special apprentices, consisting solely of college graduates, and ordinary apprentices. If any of these ordinary apprentices show any marked ability, they give them leave of absence, and allow them to go to a university in order to get that theoretical training which will make them more valuable to the railroad. On their return, they are immediately placed in the class of special apprentices. W. W. Atterbury, General Manager of the Pennsylvania, says that the rule of employing university graduates has been extended, as far as possible, to all other departments of the railroad, and with the best possible results. Speaking of the work we propose to do in McGill, Mr. Atterbury is of the opinion that such a course should assure for railroad managers and assistants greater intelligence and greater usefulness than the present methods.

Considering the locomotive department, I should like to quote the opinion of Samuel M. Vauclain, of the Baldwin Locomotive Works. He says: "The ideal training for a student intending to take up locomotive work should be a general college education along the lines of Mechanical Engineering, extending over a period of two or three years."

He also says better results might be obtained if the student could be required to take a post-graduate course in some railroad works. The greater responsibilities and the higher rewards in the operation and management of railroads are generally given to those who have been trained and developed in actual service. The result of this state of affairs is that the railroad student is used for railroad construction rather than for railroad operation. The mass of information necessary for the operation of a railroad cannot be obtained in the class room, but must be acquired in actual experience in railroad work.

As far as the operation of a railroad is concerned, we have, I think, solved the problem by establishing in connection with this railroad scheme what we call the operating department. We have three distinct branches, and you can specialize on the civil, the mechanical or the operating side, but in each of these departments everyone taking this railroad course must take certain subjects that are common to all, such as economics. In addition, we also give them in the third and fourth year a broad literary training. I would like to emphasize this fact rather fully, because we find that young men who come to us often do not know how to write a letter, and very often do not know how to say what they want to say. A great railroad manager told me, about 18 months ago, that he had had during the year several hundred applications for positions. These applications came from graduates from technical schools all over the United States and Canada, yet only a few were expressed properly, or in good language, or grammatically. Of course, this is a lamentable showing, but we hope to get rid of such criticism ourselves by continuing the English training in the third and fourth years. This will be largely done in connection with economics, the principles of which lie at the base of many of the most important problems of railroad work. The student is expected to write an essay on certain economic questions, and these essays are corrected not only from the standing of economics, but also from the literary standpoint, so that students gradually acquire the habit of writing briefly and intelligently. If we can only train up these young fellows to do this, we shall have done a great thing for the railroad profession.

Another man interviewed, who was one of those who showed the greatest interest in our scheme, was A. W. Gibbs, General Superintendent of Motive Power of the Pennsylvania Railroad at Altoona. He wrote me a long statement, and thus closed his remarks:

"Taking it altogether, I think the course is one to be very much commended, and while I do not think that from any technical institution full-fledged railroad men will ever emerge, I think that such a course will save future railroad men much of the threshing of old stuff which a man without this training would have to go through. If you can get a man to think straight, I think the rest will depend upon his opportunities, and upon the use he shall make of his training."

Walter G. Berg, Chief Engineer of the Lehigh Valley, and eminent also for his writings on this subject of engineering education, says: "The higher branches of the railroad should be considered as a profession, and as in a profession provision should be made for an adequate training. The misplaced belief that practice can only be learned in practice has caused thousands of boys, not only in railroad service, but also in mechanical and industrial pursuits, to be consigned yearly to the same rut, as others before them. Taken as a whole the young man may be able to become familiar with data and statistics, but experience is a very slow teacher, and it is usually costly to the one that pays the bills."

Opinions of this kind from men like Sir Thomas Shaughnessy and Mr. Hays, and the many others, who are the acknowledged leaders of their profession, should and did have great weight. What I wish to impress upon you is the fact that the McGill University scheme is not a scheme based upon ideas of theoretical men, but it is a scheme based upon the combined opinions of practical and theoretical men in the highest positions.

## Electrification of the Simplon Tunnel.

An interesting description of the electrification of the Simplon Tunnel appeared in a recent issue of *Engineering*, of which the following is a brief abstract: Soon after work had been started on the tunnel proposals were made to the Jura-Simplon Railway Co. to consider plans for operating the line with electricity, but as the art of heavy electric traction was then in its infancy the proposals were rejected. Subsequently attempts to interest the management in electric working met a like fate. Last year Messrs. Brown, Boveri & Co., of Baden, submitted a plan which was unusual and somewhat daring. They agreed to put in the required plant at their own risk and to work the trains through the tunnel with three-phase alternating current locomotives at a fixed rate per train-kilometer. The railway company had the option of abandoning the system at the end of a year's trial, and the contractors agreed to remove the equipment at their own cost at the end of that time if the results were not satisfactory. This offer was accepted on Dec. 19, 1905, and the contractors undertook to have the plant ready for electric working by June 1, 1906.

The contractors had on hand at their works two three-phase locomotives built by them for the Valtellina line, and they made arrangements to borrow from that road three similar machines built by Ganz & Co.* The principal task therefore was to design and install the trolley line for 3,300-volt three-phase current. Because of delays in designing and manufacturing the overhead line material actual construction work was not begun until March 1, but so rapidly was the installation made that by April 29 the electric locomotive entered the tunnel and ran in half-way. Regular operation was begun at the time set—June 1.

In bending the rails it was necessary to clean with the sand blast the surfaces of the rails and the fish plates at every joint. This was done with a portable sand-blast outfit, consisting of gas-engine driven air compressor and sand tank. The work went on continuously with three shifts of men working eight hours each. The overhead work could only be put in between 11 p.m. and 3 a.m., when no trains were running through the tunnel. The tunnel is not only very hot, but also very damp, and the design of suitable insulators for the high voltage employed was a difficult problem. The design finally adopted consists of a porcelain insulator and a rubber

*For a description of these locomotives see *Railroad Gazette, June* 9, 1905.

insulator arranged in series and each capable of receiving 18,000 volts when clean and dry. These insulators are attached to the suspending wires under the crown of the tunnel, which are spaced 100 ft. apart, and the trolley wires are hung from them. The system of insulation adopted has proved quite satisfactory, although, as a certain number of steam trains are still using the tunnel, it is found necessary every two months to wash the insulators free from the soot and dirt deposited by the locomotives. In the tunnel two small light wires are used for each phase instead of one heavy wire, because of the difficulty of stringing a heavy wire. On the approaches at Brique at one end and Iselle at the other single wires are used with a span between bents of 140 ft. These bents are made entirely of 1¾-in. gas pipe. One leg of the bent is a tripod and the other leg is made up of two pipes, splayed to give longitudinal rigidity. At Brique these bents are made to straddle six tracks. The ends of the legs are supported on concrete foundations.

When the line was first opened last June some unexpected difficulties were encountered, the most serious being the failure of the insulation in the motors of the two new locomotives built by the contractors. The ventilation of the tunnel is from north to south, and at the southern end the temperature in the tunnel is normally between 92 deg. and 94 deg. Fahr., with the air super-saturated with moisture. When a locomotive enters the tunnel this moisture condenses in streams on the cold metallic parts, and in the case of the new locomotives water poured into the ventilating ducts in the motors, with the result that the insulation quickly broke down. The old Ganz locomotives borrowed from the Valtellina line, curiously enough, escaped this trouble, owing to the fact that the gauze through which the air passes to the ventilating ducts was choked with the dust accumulated in three years' service. On renewing the insulation in the new locomotives the air ducts were closed to prevent a recurrence of the trouble. This does not interfere with the working of the machines, as the trip through the tunnel requires only about half an hour, and the motors are designed to carry their full load for this length of time without overheating. This trouble, however, was not more serious than other difficulties encountered with working by steam locomotives. The blast from the exhaust loosened the roof, and hardly a trip was made without falling stones breaking glass in the cab or following cars. The smoke and steam discharged caused so dense a fog to form at the southern end of the tunnel that the signal lamps were invisible at a greater distance than 50 or 60 yds.

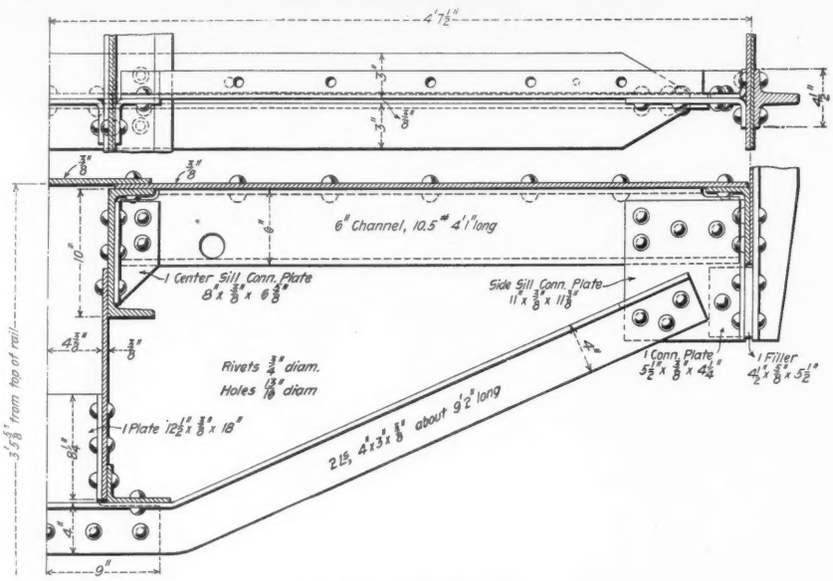
Some interesting data have been recorded showing the train resistance in the tunnel. At a speed of 44 miles an hour it requires about 400 h.p. more to haul a train in the tunnel than in the open. On the 0.7 per cent. grade at the south end it was found that the locomotive would not run down the grade by gravity if alone, but would with a train behind it. At the normal running speed of 33 miles an hour the extra resistance is about 15 lbs. per ton when the train is running in the direction of the ventilation current; in the opposite direction it is slightly greater.

Current for operating the line is obtained from power houses at both ends of the tunnel, use being made of the water power originally installed for operating the machinery used in driving the tunnels. At Brique 1,200 h.p. is available and at Iselle 1,500 h.p.

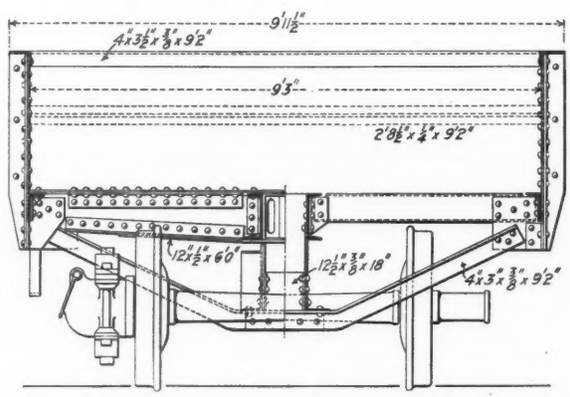
## Steel Gondola for the Newburgh & South Shore.

The Middletown Car Works has recently delivered to the Newburgh & South Shore, an industrial road of the American Steel & Wire Co. in the suburbs of Cleveland, a number of 50-ton all-steel gondolas for carrying ore, billets and bundles of wire. They embody a number of interesting departures in steel car design which are clearly shown in the accompanying drawings. The center sills, as will be seen, are 10-in., 28.8-lb. wide flange channels, continuous from end sill to end sill and reinforced in the center with a ⅜-in. web plate carrying a bottom flange angle 5 in. x 3 in. x ⅜ in., the whole forming a fish-belly girder 20½ in. deep at the center. The web plate is secured to the channel web by a single row of rivets. Any load carried by the center sills in excess of their capacity is transmitted to the plate girder sides by three cross-bearers which are shown in detail in one of the drawings. These consist of two angles

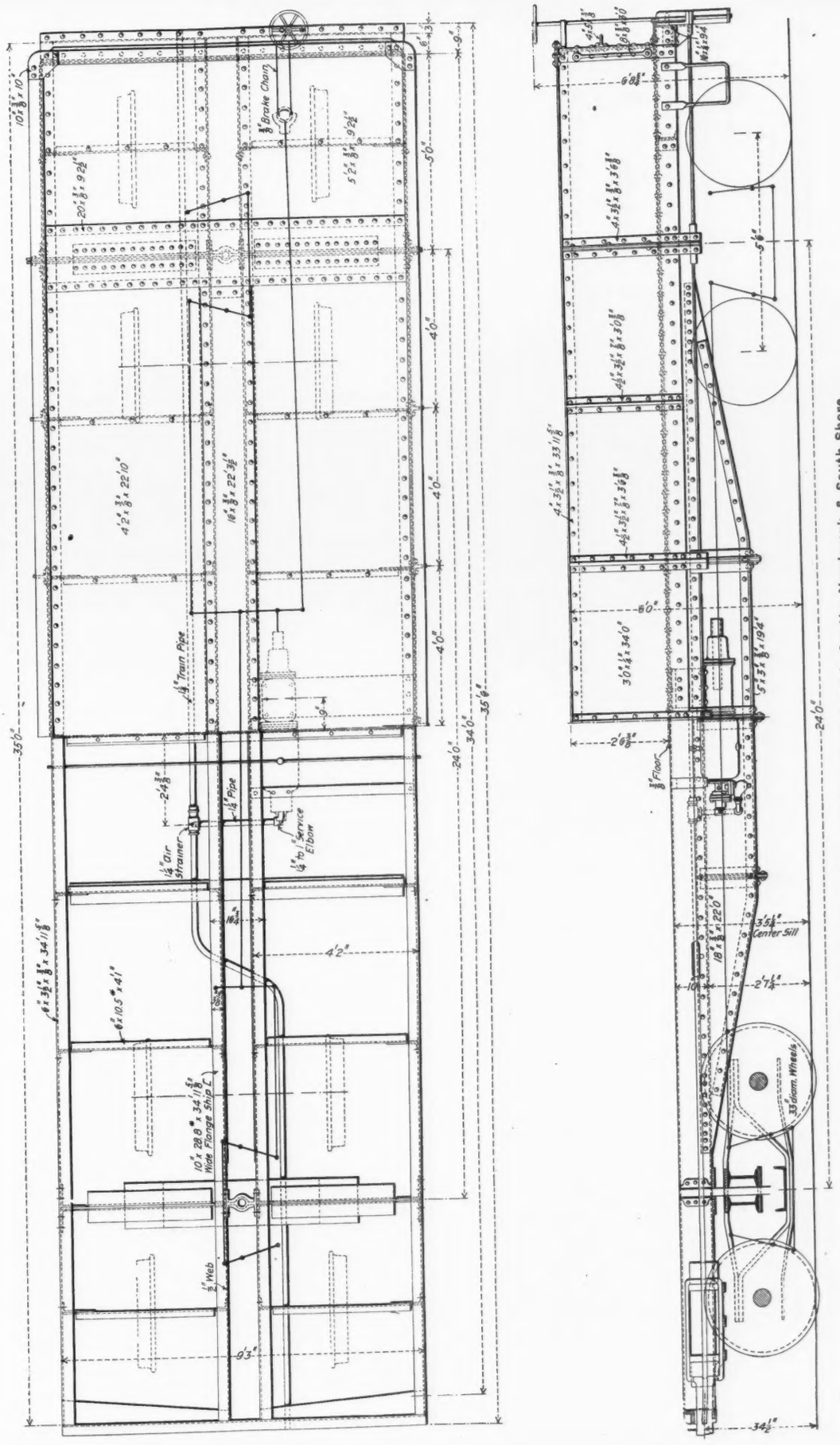

50-Ton Steel Gondola for the Newburgh & South Shore.




Detail of Cross-Bearer.




Half Cross-Sections at Bolster and Center.




Plan and Side Elevation of 50-Ton Steel Gondola for the Newburgh & South Shore.

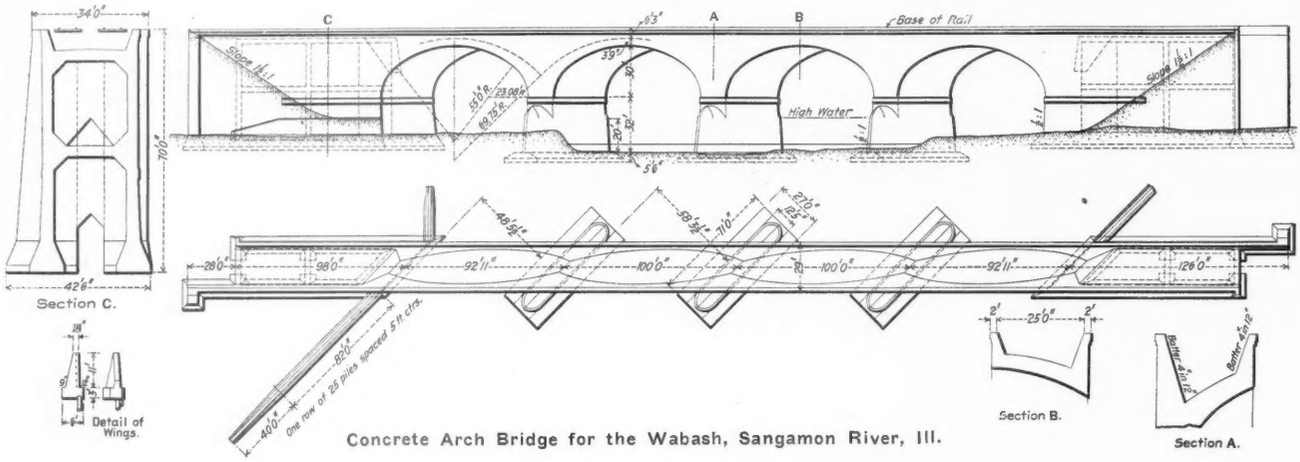
4 in. x 3 in. x ⅜ in. secured to gusset plates at their outer ends and passing across and under the center sills. The vertical stiffeners in the sides are T iron and divide the side, which is a single ¼-in. plate 3 ft. x 34 ft., into eight panels. The sides have an inside flange angle at the bottom 6 in. x 3½ in. x ⅜ in. and a top finishing angle 4 in. x 3½ in. x ⅜ in. The principal advantage in using heavy channels in the built-up center sills, aside from the additional stiffness obtained against vertical bending, is in the continuous draft sill thus obtained which simplifies the attachments of the draft gear and brings the center line of draft nearer to the center of section of the whole member.

The cars are mounted on arch bar trucks with double I-beam bolsters and 33-in. wheels. They weigh 37,500 lbs.

We are indebted to Mr. George I. King, Vice-President, Middletown Car Works, for the drawings.

### Concrete Bridge of the Wabash Over Sangamon River.

Relocating, to reduce grades and improve alinement, and double-tracking a stretch of several miles of its line, is a part of large improvement work the Wabash is doing at Decatur, Ill., to relieve congested conditions and provide adequate facilities to meet present and prospective requirements at that point. An interesting feature of this relocation and double-tracking work is the construction of a large concrete bridge over the Sangamon river, about 3½ miles east of Decatur, work on which is now in progress. A plan and elevation of the bridge and certain detail features are illustrated herewith.



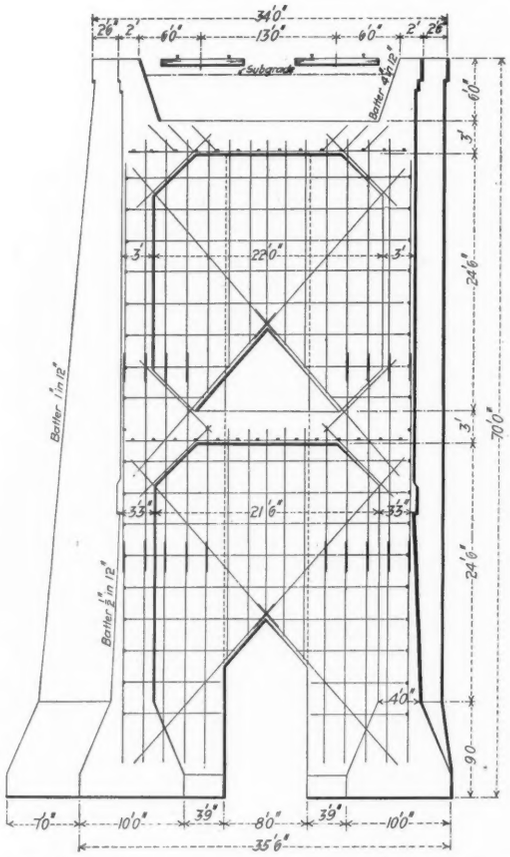

Concrete Arch Bridge for the Wabash, Sangamon River, Ill.

The bridge is on a skew of 45 deg., and its total length, out to out of abutments, is 637 ft. 10 in. There are four spans, the central or channel arches being 100 ft. c. to c. of piers, and the shore spans 92 ft. 11 in. The arches have a rise of 30 ft. and a total height above bed of stream for the channel spans of 62 ft. The bridge is designed for a loading of two consolidation locomotives of Cooper's E-50 class, followed by a train load of 5,000 lbs. per lineal foot of track, with impact added.

The foundations have a spread of 71 ft. by 27 ft. and rest on piling, there being 259 piles for each pier, spaced 3 ft. on centers longitudinally, and 2 ft. 6 in. between rows. On account of the large area over which they are spread the pier footings are reinforced with 1-in. corrugated steel bars. The arches, however, are designed as a plain concrete structure and carry only enough steel bars to take care of the temperature stresses.

The feature of chief interest in the design of the bridge is the abutments. They extend back a total distance of 126 ft., measured on the bridge center line, and are hollow. The track is carried on a slab 2 ft. 4 in. thick, and two cross walls and a lower slab, 24 ft. 6 in. below the top slab, furnish the requisite stability and strength and divide the abutment interior into four chambers. The abutments rest on piling, there being 395 piles for each, and are fullly reinforced with the 1-in. corrugated bars, details showing the bar arrangements in the cross wall included in the drawings. Openings are left in the cross walls at the bottom of each chamber for removing the forms. These openings are 8 ft. high and extend up to and conform to the position of the diagonal reinforcing rods. The rear lower chamber will be filled with earth to withstand the earth pressures from the sides and back of the abutment.

The quantities of material for the bridge are as follows: 1,500 cu. yds. dry excavation, 3,700 cu. yds. wet excavation, 31,840 lineal feet of piling, 8,416 cu. yds. of plain concrete, 4,568 cu. yds. of partly reinforced concrete, 2,918 cu. yds. of fully reinforced concrete, and 192 tons of 1-in. corrugated steel bars. The cost of the bridge will be about $177,000, and it is expected to have it done by June, 1907. The bridge was designed under the direction of Mr. A. O. Cunningham, Chief Engineer of the Wabash. Wm. P. Carmichael Company, Williamsport, Ind., is the contractor.




Cross-Section Showing Abutment Cross-Wall Reinforcing Rods (All 1-in. Corrugated Bars).

### Foreign Railroad Notes.

The Great Northern Piccadilly-Brompton "tube"—underground railroad—in London was opened for business last week. By this line there will be a nine-mile underground line from Hammersmith to Finsbury Park, with a new system of through fares between the tramways and the tubes, old and new. The new tube is fully 100 ft. below Piccadilly, and has cost over $4,000,000 a mile.

The Austrian State Railroads contemplate establishment of regular automobile stage-coach lines from certain stations to places a few miles distant. This is especially desired for summer excursion traffic in the mountains, where the resorts are, many of them, inaccessible by rail. In the Tyrol no less than 30 places have asked for such lines, and many of them are willing to guarantee the cost of working them.

## The Kansas City, Mexico & Orient.

This road is being built by A. E. Stilwell, of Kansas City, the promoter of the Kansas City, Pittsburg & Gulf Railroad, now the Kansas City Southern. Mr. Stilwell took the project up shortly after he lost control of the Pittsburg & Gulf, in 1899. It is to extend from Kansas City through Kansas, Oklahoma, Texas and Mexico to Topolobampo on the gulf of California, a distance of 1,659 miles, and will provide a short route for traffic from the central part of the United States to a Pacific port. The portions completed and in operation aggregate 409 miles, divided as follows:

| From | To | Distance |
|---|---|---|
| Wichita, Kan. | Clinton, Okla. | 193 miles. |
| Sweetwater, Tex. | Knox City, Tex. | 77 " |
| Chihuahua, Mex. east | | 66 " |
| El Fuerte, Mex. | Topolobampo | 73 " |

The right has been secured to operate over the Chihuahua & Pacific from Chihuahua to Minaca, a distance of 122 miles, leaving 1,128 miles of track still to be laid. Of this amount grading is practically completed on 383 miles, located as follows:

| | | |
|---|---|---|
| Between Emporia, Kan., and Eldorado, Kan. | 62 | miles. |
| " Clinton, Okla., and Knox City, Tex. | 161 | " |
| " Sweetwater, Tex., and San Angelo, Tex. | 75 | " |
| " End of track 66 miles east of Chihuahua and Conchos R. | 45 | " |
| " Bocoyna, Mex., and El Fuerte, Mex. | 40 | " |

Concrete abutments and piers and culverts have been built between Emporia and Eldorado, and steel spans are delivered for river crossings on this stretch. Most of the smaller openings on the other stretches have been built. The bridges will be built as the track reaches them.

The heaviest grading is between Bocoyna and La Junta in the crossing of the Sierra Madre mountains. A location has been adopted on each of the stretches which have not been graded.


Map of the Kansas City, Mexico & Orient.

The operating divisions and maximum grades and curves will be as follows:

| | Distance, miles. | Grades, per cent. Eastb'nd. | Westbound. | Curves |
|---|---|---|---|---|
| Kansas City to Wichita, Kan. | 204 | 5/10 | 6/10 | 4 degrees |
| Wichita to Fairview, Okla. | 127 | 5/10 | 6/10 | 4 " |
| Fairview to Diaz, Tex. | 162 | 1 | 1¼ | 4 " |
| Diaz to San Angelo, Tex. (2 div). | 218 | 1 | 1 | 4 " |
| San Angelo to Ft. Stockton, Tex. | 166 | 1 | 1 | 4 " |
| Ft. Stockton to El Oro, Tex. | 145 | 1 | 1 | 4 " |
| El Oro to Chihuahua, Mex. | 169 | 1 | 1 | 4 " |
| Chihuahua to Bocoyna, Mex. | 179 | 2 | 2 | 10 " |
| Bocoyna to La Junta, Mex. | 172 | 2½ | 2½ | 12 " |
| La Junta to Topolobampo | 117 | 1 | 1 | 8 " |

An elevation of 1,507 ft. will be reached in Kansas, 1,854 ft. in Oklahoma, 5,095 ft. in Texas and 7,970 ft. in Mexico.

The roadbed in embankment has a width of 15 ft. at crown with slopes of 1½ to 1, and in excavation a width of 20 ft. at base and slopes of 1 to 1, except that rock cuts have slopes of ¼ to 1. Bridges are designed to carry two consolidation engines each weighing 136 tons, followed by a uniform load of 4,000 lbs. per lineal foot. Timber trestles have 14-ft. panels and three-ply chords, consisting of 8-in. x 16-in. stringers. All bridges in Mexico are to be metal on stone or reinforced concrete supports, or reinforced concrete culverts. Ties are 6 in. x 8 in. white, post or burr oak, or burnettized short leaf yellow pine. All rail is 70-lb. A. S. C. E. standard section, in 30 or 33-ft. lengths connected by four-hole angle bars in which bolts are staggered.

By means of the Kansas City Outer Belt & Electric Ry., which is being built by Mr. Stillwell, connection will be made with nearly every steam railroad entering Kansas City.

It is expected that freight revenue will be derived largely from agricultural products of Kansas and Oklahoma, live stock of Oklahoma and Texas, and high and low-grade ores from mines which will develop along the route in Mexico, and also from traffic that will be interchanged with steamship lines operating between the Orient and the Pacific coast. A considerable portion of the Kansas City, Mexico & Orient will be a pioneer road. Practically all the existing lines crossed by it in Texas are east and west lines, but in Mexico, its general direction is westerly and the lines crossed are north and south roads.

A survey has been made for a branch about 180 miles long from San Angelo to Del Rio, Texas, to provide a direct city of Mexico connection.

## The True Perspective of the Supply Department.

BY ERNEST J. M'VEIGH,
Storekeeper, Grand Trunk Railway.

The article under this heading in the *Railroad Gazette* of Dec. 29, 1905, interested the writer very much, and he has waited in the hope of seeing something further on the subject, either in agreement or disagreement with Mr. Yeomans' proposition, but apparently the paper has not created the interest that it deserved.

That a supply agent reporting to the General Manager would be of great economic value, everybody who has knowledge of the subject of railroad supplies is likely to admit, unless he happens to be in a position where the appointment of such an officer would seem to clash with his interests; but a move in the direction of apparently increasing the cost of handling the supplies requires very little opposition to kill it. The attitude of the human mind in regard to the question of supply is most peculiar, and to the student who may be so fortunate as to possess a sense of humor, extremely funny. From the laborer who doles out his scanty wages with growls and kicks for household expense, to the General Manager of a great railroad system, it may seem to be a far cry, and yet one touch of nature makes them kin. To both, the everlasting outlay is an evil thing they would forget if they could, but unfortunately they cannot, as it happens to be the great question of the world, and must be faced. In the home, in business, in the army and wherever man moves and has his being, we cannot eliminate the evil fact that there are expenses to be met, so there is nothing for us to do but to face them and keep them under subjection lest they devour us. It has been a source of wonder to the observing man for years past that the supply department of our railroads has improved so slowly.

Some years ago a writer on this subject asked this question, "why is it that a railroad company will count its money three times as it comes in, and follow up an item of five cents until someone makes good, while the same company has hundreds and even thousands of dollars worth of material going to waste for want of attention"? At that time I could see just that condition of affairs very close to me, but I could not answer the question.

I have devoted a good deal of thought to the matter since that time, and I think I can see a few reasons why these conditions still prevail to a greater or less extent. In no business in the world can it be so truly said that improvements must come from the top as in the business of railroading, and there are very few men at the top of the railroads of America who have had practical knowledge of the details of handling supplies. Their training has generally been in departments where they naturally have looked on the supply department as the enemy, and when they become managers and must keep the balance on the right side of the ledger they are more than ever convinced that it is an evil thing, and listen with impatience to any reference to increasing the cost of its supervision. To appoint a supply agent in addition to the purchasing agent and storekeepers would appear to such an officer amounting simply to an increase in expenditure, and he would not be in a position to know just what the right man in that position could do. Each railroad has its own plan of handling supplies, and it is a fact much to be regretted that each is satisfied with its own particular plan. While they are satisfied, there will be no improvement.

Let us glance at two examples. On one system, the organization consists of the purchasing agent and his staff, whose jurisdiction covers the ordering and delivery of material on requisitions sent him. Then, for 2,000 miles of line there is a general storekeeper who requisitions, receives and distributes all supplies other than stationery, fuel and ties, and all local storekeepers and men in charge of material are nominally under his charge and report to him. His jurisdiction is in fact nominal, for the reason that most of these men are compelled to attempt the impossible, and serve two masters; the man on the spot who uses the material, and the general storekeeper many miles away. Which one do you think the local storekeeper will cater to? Here it is that the general storekeeper loses his grip, as it is humanly impossible for him, encompassed with heavy detail at headquarters, to know the conditions and requirements on his 2,000 miles of road, and he is

sending out supplies on requisitions approved by men who know little and care less about actual requirements, and whose motto is, "get all the stuff we think we may need, and then get a little more." It is true that the general storekeeper may send out one of his assistants on an occasional inspection trip, but this is only a case of the blind leading the blind, for what chance has the assistant had to make a study of the situation? Without a full knowledge of the matter, his time is wasted.

It is pleasant to talk of co-operation, and in theory co-operation can be made to solve most of these troubles. But, unfortunately, we never get much beyond theory in that line, and it is as well to deal on a basis of fact, and not expect the men whose business lies in maintenance of way, in repairs and renewals of bridges and buildings, repairs to cars, repairs to engines, and running trains, to take an interest in supplies, further than to see that each follows the maxim and gets all he requires and a little more.

Now enters the supply agent, who reports to the General Manager and has jurisdiction over all stocks. We will start out with the presumption that he possesses the requisite qualifications. That is, he is simply a practical man in the matter of supplies, and can recognize all items of railroad material when he sees them (there are 3,400 of these items, so he must have had some experience), and has a good working knowledge of the road he is going to work on, and a knowledge of the requirements of that particular road as well as a general knowledge of the money value of stock required per mile of average road, or division of road. His duties are to visit regularly all points where material may be stored, examine it carefully, consult with the men in charge, receive their complaints, criticise quality of material, carry with him a list of requirements from point to point and redistribute as he finds a surplus in one place and a shortage in another. He must inspect scrap bins and report where material is being put into scrap when it could be re-used with profit, and he must see that all scrap is shipped promptly, and that it is not allowed to lie around stations, section houses and yards.

Then there are hand-car houses and section houses to be cleared out, and the collection of material that drops from engines and cars must be moved; material that the track men will keep, in spite of all orders to the contrary. Also, all material that each year becomes obsolete owing to changes in equipment must be picked out, and special attention must be given to air and steam heat, hose and couplings. In this particular alone there is room for large saving of money per year on most of the roads in America, and I think it can be proved that on every thousand miles of road in America there is an unnecessary loss of $2,000 per year in this item alone.

Then comes up the question of the manufacture of supplies. Most railroads now make more or less material to supply their requirements, and as they frequently make up stuff that can be bought in the trade for half the money it costs them to manufacture, this also requires constant attention. Then there are the vans to clean out, once each year, to get surplus supplies from them. The quantity of material found for redistribution in vans alone will amount to more than a good salary. I have cleaned out 12 in two hours, and gotten $450 worth of material that was of no use to the train men (but they had it!) and the stations must not be overlooked; they will repay the gleaner for the time spent in visiting them.

The man appointed to the position of supply agent need not be loaded down with detail. On 3,000 miles of railroad he should not require more than a small office and a stenographer, and his office duties need not go beyond dealing with requisitions that come to him for approval, and his correspondence. We have the machinery for purchasing and distributing the supplies; what we want is someone with knowledge and authority to look after them.

On another system the organization is somewhat different from that which has been outlined. The purchasing agent has full control of the purchasing department and the storekeepers. He divides the system into divisions, and has one storekeeper for each division who handles a general stock, and accounts to the purchasing agent and audit office for the same. But in addition to this, there are motive power, transportation, car and shop stocks into which the general stock is emptied, so that at all times there is 50 per cent. of all new material on the system out of the hands and control of the men whose business is looking after supplies, and under the charge of men whose first duties are the various works pertaining to the operation of the line, and who regard the supply department as the enemy to be made a scapegoat of at all times. It is true that they must account for the goods under their charge when used, but who is to say whether they have twice the quantity on hand that they should have? They will never acknowledge they have enough, but, like Oliver Twist, will ask for more, and not always with as good reason as Oliver had.

Will anyone with knowledge of this subject say there is no room for the supply agent here?

I expect the author of your paper of last December might be inclined to say that I have reduced his important official to the level of a mere inspector, but I don't think we are looking for a kid-gloved official with a large staff compiling useless statistics. What we want is a man of knowledge and experience, who will work, and be a help both to the purchasing agent, the storekeepers, and the men who use the supplies, and save the money of the company he works for. Money saved is money made, and, speaking generally, the railroads of this country are in the business to make money.

## Santa Fe Organization, 1906.

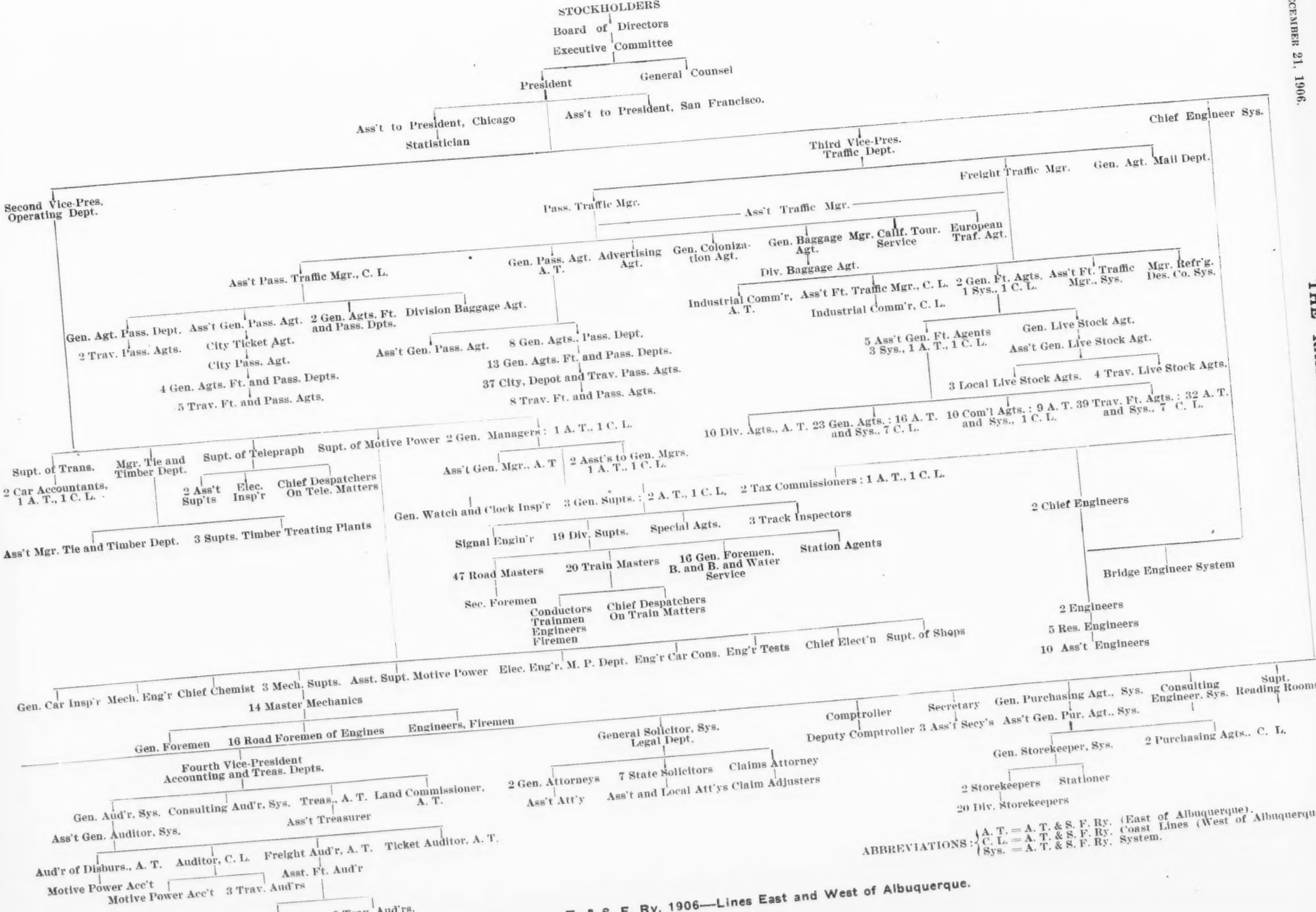
The new "Employees' Magazine" of the Atchison, Topeka & Santa Fe prints the organization chart of the system, shown herewith. Like that of most of the great American railroad systems, the Santa Fe organization cannot be classed as being either clearly departmental or divisional, but it is a mixture of the two, with jurisdictions sometimes interwoven. Take the case of the chief engineer. He is a departmental officer on the chart shown, reporting his forces to the president and not to the operating department, as, for example, in the remarkable divisional organization of the Illinois Central, where the chief engineer reports to the assistant general manager. But from the fact that he is chief engineer of the entire system, his work must necessarily border on that of the consulting engineer, who is a staff officer without a "department," strictly speaking; reporting also to the president. The subordinate chief engineers, presumably directly responsible for field work, come also under the jurisdiction of the operating department—as it is right and natural that they should—together with their assistants, including the bridge engineer of the system. In the Pennsylvania organization (*Railroad Gazette*, July 13, 1906), which may be taken as a type of the divisional, the general manager's jurisdiction does not extend over the chief engineer nor the chief of motive power, both of these officials being staff officers to the second vice-president direct. But the Pennsylvania general manager has authority over the general superintendent of motive power (the active head, as differentiated from the chief of motive power, responsible for design) over the chief engineer of maintenance of way, with whom he is directly concerned, and, through his general superintendents, over all the "help" needed to keep his railroad in order, as well as to operate it.

The question whether a given organization is departmental or divisional resolves itself, at the last analysis, into a listing of the officials who report direct to the general manager and his superintendents, in comparison with those who are staff officers reporting to the president or to a vice-president. The following table compares the Santa Fe and Pennsylvania organizations of 1906 with the departmental organization devised for the Rock Island system in 1904, but subsequently changed for the divisional one now in effect. It will be seen that, of the three, the Pennsylvania lodges the greatest amount of control in the hands of the general manager and general superintendent, the Santa Fe takes a midway position, while the Rock Island organization tends to carry authority in special fields past the general manager, so far as possible. As regards the superintendent of transportation, superintendent of motive power, superintendent of telegraph and the master mechanics, the Santa Fe organization is, however, the most strongly departmental of the three. If the position of the division engineer be accepted as the test—and it makes a very good one—it will be seen that this part of the Pennsylvania organization is straight divisional; of the Santa Fe, mixed, and of the 1904 Rock Island, straight departmental.

| Officer. | Santa Fe, 1906. Officers in left-hand column are as below | Pennsylvania, 1906. Officers in left-hand column are as below | Rock Island Dept. organization of 1904. under jurisdiction |
|---|---|---|---|
| Supt. of Motive Power... | 2d Vice-Pres. | 2d Vice-Pres. / Gen. Manager. | Gen. Manager. |
| Chief Engineer ..... | President.* | 2d Vice-Pres. | 4th Vice-Pres. |
| Eng. Maint.-of-way ..... | Chief Engineer. / Gen. Manager. | Gen. Manager. | 4th Vice-Pres. |
| Ass't Engineer ..... | Chief Engineer. / Gen. Manager. | 2d Vice-Pres. | Chief Engineer. |
| Eng. Bridges & Buildings | Chief Engineer. / Gen. Manager. | 2d Vice-Pres. | Eng. M.-of-W. |
| Division Engineer ..... | Chief Engineer. / Gen. Manager. | General Supt. | Eng. M.-of-W. |
| Signal Engineer ..... | Chief Engineer. / Gen. Manager. | Gen. Manager. | Eng. M.-of-W. |
| Bridge Engineer ..... | Chief Engineer. / Gen. Manager. | Chief Engineer. / 2d Vice-Pres. | Eng. M.-of-W. |
| Master Mechanics ..... | 2d Vice-Pres. | General Supt. | Gen. Manager. |
| Supt. of Telegraph ..... | 2d Vice-Pres. | Gen. Manager. | Gen. Manager. |
| Supt. of Transportat'n.. | 2d Vice-Pres. | Gen. Manager. | Gen. Manager. |

*Staff officer. Ass't Chief Engineers report also to the respective General Managers.

Although the respective arguments for the two types of organization have often been discussed in the *Railroad Gazette*, it may be well to repeat, in brief summary, that the position of the departmentalists is based on the belief that, in a great system embracing eight or ten thousand miles of line, no one man can be found able to handle in an expert manner such diverse problems as those relating to motive power, road maintenance, and train operation. On




**Organization of the A. T. & S. F. Ry. 1906—Lines East and West of Albuquerque.**

the other hand, advocates of the divisional organization say that these three elements are inseparable, and must be handled by one strong arm if harmony and success is to be looked for. There is obvious truth in both points of view, and as a result it is hard to find an American railroad organization that is a pure example of either type. As a nation, we lean to the divisional, while the characteristic British organization is sharply departmental, the head of the motive power department ranking almost with the general manager, corresponding in rank to our president, and often reporting to nobody but his directors.

### Compound Locomotive for the Kansei Railway, Japan.

The American Locomotive Company has recently completed three eight-wheeled, two-cylinder compound locomotives at the Pittsburg works for the Kansei Railway of Japan. Aside from the compound feature, the engines have a few points of interest that are not usually found in American locomotives. The most striking of these is the arrangement of the wheels beneath the tender. The gage of the Japanese road being but 3 ft. 6 in. the engine is lighter than those now built for similar service in this country and weighs only 43 tons, or the equivalent of an older class with 17-in. by 24-in. cylinders. The tender is correspondingly small and has a capacity of but 2,400 gals. of water and five tons of coal. This is carried on three pair of wheels, two set in a light diamond truck and one at the front held rigidly in the pedestal. In this there is a radical difference from English practice, where the three pair of wheels are usually put in the pedestals, forming a rigid wheel base for the tender. This might almost be called the Americanizing of the English design.

A second modification of English practice is to be found in the attachment of the forward wheel guards. These, instead of being fastened to the engine frame, are attached to the frame of the forward truck. This is a logical method in so far as the maintenance of the guard directly over the rail is concerned, but if an obstruction on the track were to be encountered, especially if it were on but one rail, it would seem that a derailment would be much more apt to occur than if the blow were to be received by the engine frame, as in the case of the English locomotive or American pilot.

The tubes of the engine are exceedingly short (9 ft. 4 in.) so that the distance from the center of the forward drivers to the center of the cylinders is cut down to 9 ft. 5 in., which has had its corresponding effect on the length of the connecting rod, which is only 5 ft. 8 in. long, or on a ratio of less than three to one of the stroke; proportions that are rarely met in modern construction. By drawing the truck center back, it also produces that stocky appearance of the engine that is so marked a feature of some Austrian designs where the same thing is done in order to lessen the weight on the drivers and thus keep them within the allowable load limits.

The forward drivers are about the same distance ahead of the firebox as in the older type of American engines ($15^{7}/_{16}$ in.), which gives a clearance for the eccentric straps and no more; while the side rod is shortened to correspond to the length of the firebox, which is 66 in.

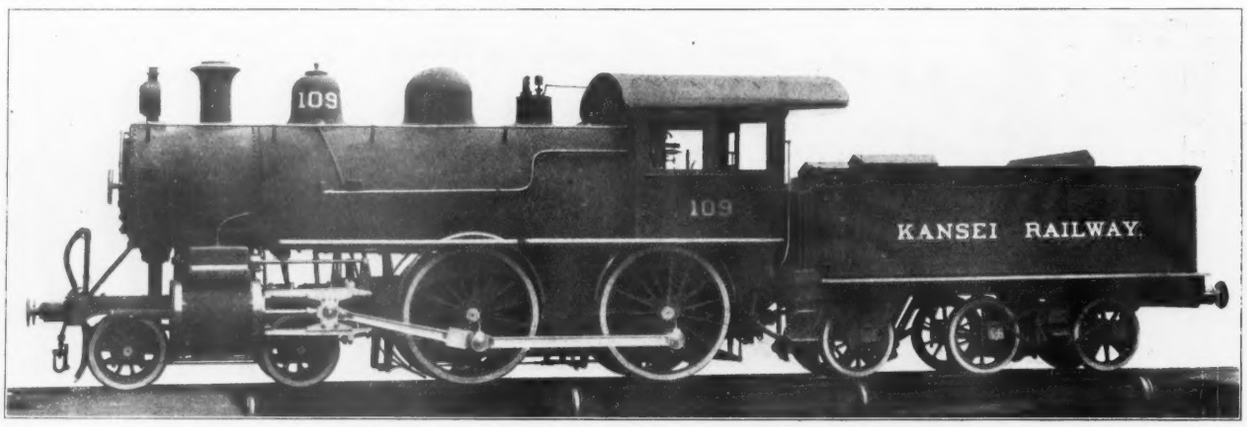
For the old American locomotive working on a 4-ft. 8½-in. gage, and of about the same cylinder capacity as this engine, the heating surface would have been about 1,200 sq. ft., or a trifle more. Here it is 1,044 sq. ft., but the steam pressure is higher, 180 lbs., as against a probable 140 lbs. in the engine referred to, so that there is an increase of 28 per cent. in steam pressure to compensate for a loss of 12.5 per cent. in heating surface.

In the proportions of the cylinders there seems to have been a reversion to original practice. The ratio of the high to the low-pressure is as 1 to 2.16, which is somewhat less than that used when the two-cylinder compound was first exploited, or that recommended by Herr von Borries in his earlier designs when it was made 1 to 2.2.

The springs for the driving wheels are all underhung with the equalizer below the bottom frame rail. The frame is of the standard bar form and the firebox rests directly upon it with expansion plates instead of the usual buckle plates. There is one waist plate at the guide yoke, thus completing the resemblance to the design of American locomotives that were standard 30 years ago; but from which it has departed in the diameter of the boiler, the steam pressure, the headlight, dome and width of firebox.

The following are some of the principal dimensions of these engines:

| | |
|---|---|
| Cylinders, H. P., diameter | 17 in. |
| Cylinders, L. P., diameter | 25 " |
| Piston, stroke | 24 " |
| Gage of track | 3 ft. 6 in. |
| Wheel base, driving | 7 " 6 " |
| " " total | 20 " 0 " |
| " " engine and tender | 38 " 5⅝ " |
| Weight in working order | 86,000 lbs. |
| " on drivers | 52,400 " |
| " engine and tender | 139,900 " |
| Heating surface, tubes | 963 sq. ft. |
| " " firebox | 81 " |
| " " total | 1,044 " |
| Grate area | 13.25 " |
| Boiler, fuel | Soft coal |
| " pressure | 180 lbs. |
| Axles, driving journals | 6½ in. x 7½ in. |
| Axles, tender journals | 3¾ in. x 7 in. |
| Firebox, length | 66 in. |
| " width | $28^{7}/_{8}$ " |
| " thickness, crown sheet | ½-in. |
| " thickness, side and back sheet | $^{9}/_{16}$-in. |
| " thickness tube sheet | ⅞-in. |
| " water space front | $3^{5}/_{16}$ in. |
| " water spaces sides | 2½ in. |
| " water space back | 3 in. x 4 in. |
| Tubes, material | Brass |
| " number | 228 |
| " diameter | 1¾ in. |
| " length | 9 ft. 4 " |
| Smokestack, diameter | $12^{3}/_{4}$ " |
| Smokestack, above top of rail | 12 ft. |
| Tank capacity, water | 2,400 gals. |
| Tank capacity, coal | 5 tons |
| Tractive power | 14,350 lbs. |




Narrow-Gage Compound for the Kansei Railway, Japan.

$$\frac{\text{Weight on drivers}}{\text{Tractive power}} = 3.65$$

$$\frac{\text{Total weight}}{\text{Tractive power}} = 6.0$$

$$\frac{\text{Tractive effort x diam. of drivers}}{\text{Heating surface}} = 853.0$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 79.0$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 0.077$$

$$\frac{\text{Weight on drivers}}{\text{Heating surface}} = 50.2$$

$$\frac{\text{Total weight}}{\text{Heating surface}} = 82.3$$

$$\text{Vol. of 2 equivalent simple cylinders} = 5.2 \text{ cu. ft.}$$

$$\frac{\text{Heating surface}}{\text{2 equivalent simple cylinders}} = 207.7$$

$$\frac{\text{Grate area}}{\text{2 equivalent simple cylinders}} = 2.55$$

In the fitting of the engine cast-iron is used for the boxes and cast-steel for the driving wheel centers. The firebox is of copper with copper staybolts and the tubes of brass. It has the automatic

vacuum and hand brakes on both the driving wheels and the tender. The valves are of the balanced Richardson type, with 5-in. travel and ⅞-in. lap for the high-pressure, and 6-in. travel and 13/16-in. lap for the low-pressure, with an exhaust clearance of 3/16 in. In seting the high-pressure has a lead of 1/16" in. and the low-pressure 3/32 in. A double exhaust pipe is used. The tender frame is of 7-in. steel channels and is carried on wheels of 36 in. diameter.

## Cost of Steam Shovel Work.*

BY JOHN C. SESSER,
Engineer of Construction, Chicago, Burlington & Quincy Railway.

In the rebuilding of railroads throughout the country, the railroads are doing or organizing to do their steam-shovel work with company forces and equipment. That they are better fitted and able to do this work from 25 to 30 per cent. cheaper than the price for which it could be contracted is a fact without question.

Among the various jobs of grade reduction work which were done on the Burlington System during the season of 1906, there were two on the Beardstown-to-Centralia Division, known as the Big Shoal and Little Shoal cut-offs, respectively.

### BIG SHOAL CUT-OFF.

The Big Shoal cut-off was a change of alinement and grades between Sorento and Reno, Ill. On this cut-off there were 318,711 cubic yards of earth to be moved, of which 251,711 cubic yards were steam-shovel work. Bids were asked of the larger contractors of this country for this grading, and, while their prices per yard were reasonable, they were higher than that for which the company could do the work. Consequently it was decided that the company should do the work with its own forces and equipment.

On this work two temporary trestles were built, having a total length of 2,961 ft. and an average height of 40 ft. The material for the embankment was hauled from the north, an average distance of one and one-half miles. The average depth of cut was 15 ft. The material handled was clay. On account of numerous springs encountered, both material and steam-shovel pit were very wet, which delayed this work to some extent. At times the clay would leave the dipper in chunks as large as the dipper itself. This made the dumping of cars from the high trestle rather dangerous, and necessitated the locking of the cars to the trestle before they were dumped.

The work being entirely separated from the main line, where boarding cars would have been impracticable, bunk houses were built for the men employed on this work. These houses were constructed out of the ordinary rough lumber, matched lumber being used for the flooring only. The camp consisted of a bunk house for the laborers, cook house, bunk house for the shovel, engine and bridgemen, commissary, bath and oil house. The bunk house for the laborers was 16 x 62 x 10 ft. high. This building accommodated seventy-two men. One single row of bunks was built on each side of the building, and a double row through the center. These bunks were 6 x 2 ft. 6 in. wide. This left an aisle of 3 ft. 6 in., which was ample.

The bunk house for the engine, bridge and shovelmen was 16 x 56 x 10 ft. high. This building was divided into three compartments, so as to keep each class of men by themselves. Bunks were built to accommodate 20 shovelmen, 16 bridgemen and 20 trainmen.

The cook house was 16 x 110 x 10 ft. high, with the kitchen (16 x 24 ft), in the center. The dining rooms were at either end of the building. The room for the laborers, at one end, would accommodate 80 men, and the room at the other end 60 men, which was used by the shovel, train and bridgemen only.

The commissary was a small building, 18 x 24 ft., in which was kept supplies for the men, kitchen, etc.

Board was furnished the men for $3.75 per week by the boarding contractor for the system.

Water was suppliled to the shovel by a two-inch pipe line, laid on the ground outside of the digging line. At every hundred feet this pipe line had a "T" with a tap, and by means of a long rubber hose water could be supplied the shovel at all times, thus avoiding the usual delay of siphoning water which, in double-shift work, is an item worth consideration. This pipe line was also extended to the cook and bunk houses, thus supplying water for cooking and washing purposes.

The temporary trestle built was designed to carry a loaded train of five-yard dump cars before being filled, and the engine in service only after the trestle had been filled. Each bent consisted of two soft wood piles, bracing and cap. Second-hand material was used throughout, with the exception of the bracing. Two 8 x 16-in. stringers were used per span, which were built 13 ft. The stringers were recovered, the balance of the material buried in the embankment.

The following reports show the cost to the railroad company of this steam-shovel work. In these reports the cost of each kind of work in connection with the steam shovel grading is given. Where equipment of this kind is used, it is taken as a fair average.

Comparing these two reports as to final cost, it is interesting to note that the cost per yard in place on either job is precisely the same. While the equipment and organization were, in a way, about the same at both places, the material handled and the general layout of the work were very different.

FINAL REPORT, BIG SHOAL STEAM SHOVEL WORK.

*Equipment.*

1 65-ton Bucyrus steam shovel.
2 Switch engines (Class "E"), weight on drivers, 30 tons.
43 Five-yard dump cars.
1 Jordan spreader.

(All yardage, cross-section measurements.)

*General.*

| | |
|---|---|
| Date shovel commenced work | April 27 |
| Date shovel completed work | Nov. 2 |
| Date shovel commenced night shift | June 20 |
| Date shovel completed night shift | Oct. 26 |
| No. of days steam shovel on work | 190 |
| No. of nights steam shovel on work | 129 |
| Total | 319 |
| Total days worked by steam shovel | 140 |
| Total nights worked by steam shovel | 88 |
| Total days worked by steam shovel (10-hr. shift called a day) | 228 |
| Shovel laid up due to rain and Sundays (shifts) | 57 |
| Shovel delayed on account of moving shovel and shovel failure (shifts) | 23 |
| Waiting for grading of temporary track (shifts) | 11 |
| Percentage of days of shovel service shovel delayed | 25 per cent. |
| Total car output, day shift. | 47,862 |
| Total car output, night shift. | 27,377 |
| Total | 75,239 |
| Cubic yards handled, day shift | 160,121 |
| Cubic yards handled, night shift. | 91,590 |
| Total | 251,711 |
| Cubic yards, per car. | 3.35 |
| Cubic yards per day (10-hr. shift called a day) | 1,104 |
| Percentage of night-shift output to day-shift output | 84 per cent. |
| Length of haul, average distance | 1½ miles. |
| Material, where dumped | Temporary trestle |
| Kind of material | Wet clay |
| Condition of pit | Wet |

COST.

*Equipment, Etc.*

| | Value. | Depreciation. Per cent. | Depreciation. Amount. |
|---|---|---|---|
| 1 Second-hand steam shovel | $5,000.00 | 10 | $500.00 |
| 2 Second-hand Class "E," switch engines | 4,400.00 | 5 | 220.00 |
| 43 Second-hand 5-yd. dump cars. | 5,052.50 | 10 | 505.25 |
| 1 Jordan spreader | 1,800.00 | 5 | 90.00 |
| Total | | | $1,315.25 |
| Bunk house: Net cost of material | | | $757.18 |
| Net cost of labor | | | 387.68 |
| Total | | | $1,144.86 |
| Water Supply: Net cost of material | | | $191.43 |
| Net cost of labor | | | 81.17 |
| Total | | | $272.60 |
| Grand total cost of equipment used | | | $2,732.71 |

*Cost Steam Shovel Service—Labor.*

| | |
|---|---|
| Total cost steam shovel service | $6,228.54 |
| Cost per cubic yard | .024 |
| Total cost engine service (2 engines) | 6,417.33 |
| Total cost per yard. | .026 |
| Total cost car repairing and blacksmithing | 771.47 |
| Total cost per yard | .003 |
| Total cost of lighting for night work | 184.62 |
| Total cost per yard. | .001 |
| Total cost dumping cars | 4,265.51 |
| Total cost per yard | .017 |
| Total cost of all labor steam-shovel service | $17,867.47 |
| Total cost per yard. | .071 |

*Cost of Shovel, Engines, and Car Supplies.*

| | |
|---|---|
| 369 gals. valve oil used, at 50 cts. per gal. | $184.50 |
| 500 gals. black oil used, at 18 cts. per gal. | 90.00 |
| 51 gals. signal oil used, at 34 cts. per gal. | 17.34 |
| 4,946 gals. kerosene used, at 10 cts. per gal. | 494.60 |
| 754 gals. gasoline used, at 17 cts. per gal. | 128.18 |
| 1,040 tons coal used by shovel, at $1.48 per ton | 1,539.20 |
| 1,339 tons coal used by engines, at $1.48 per ton | 1,981.70 |
| 800 lbs. waste used, per 6 cts. per lb. | 48.00 |
| Total cost of supplies | $4,483.52 |
| Total cost per yard | .018 |
| Grand total cost shovel work (labor) | $17,867.47 |
| Grand total cost shovel work (supplies) | 4,483.52 |
| Grand total cost. | $22,350.99 |
| Per yard | .089 |

*Temporary Trestle.*

| | |
|---|---|
| Total cost of trestle | $9,007.80 |
| Length of trestle | 2,961 ft. |
| Average height | 40 ft. |
| Cost per linear foot (labor) | $1.30 |
| Cost per linear foot (matecial) | 1.74 |
| Total cost per linear foot | $3.04 |
| Total cost per yard | .036 |

(Cost includes labor for removing stringers.)

*Track Work.*

| | |
|---|---|
| Total cost of all labor | $11,582.31 |
| Total cost per yard. | .046 |
| Value of track supplies | 7,338.76 |
| Depreciation and actual cost of work | 856.11 |
| Total cost of track work | $12,438.42 |
| Total cost per yard for all track work | .049 |

SUMMARY OF COST.

| | Total. | Per yard. |
|---|---|---|
| Equipment, etc. | $2,732.71 | $0.010 |
| Steam shovel service. | 22,350.99 | .089 |
| Temporary trestle | 9,007.80 | .036 |
| Track and track work | 12,438.42 | .050 |
| Supervision and engineering | 610.38 | .002 |
| Total | $47,140.30 | $0.187 |

*Reprinted from Bulletin 81, November, 1906, American Railway Engineering and Maintenance-of-Way Association.

OUTLINE OF FORCE.

*Day Shift.*

| | | |
|---|---|---|
| 1 | General foreman, at | $118.50 per month |
| 1 | Steam shovel engineer, at | 125.00 per month |
| 1 | Steam shovel cranesman, at | 90.00 per month |
| 1 | Steam shovel fireman, at | 55.00 per month |
| 6 | Steam shovel pitmen, at | 19 cts. per hour |
| 1 | Conductor, at | 103.50 per month |
| 2 | Brakemen, at | 69.00 per month |
| 2 | Enginemen, at | 4.00 per day |
| 2 | Firemen, at | 2.40 per day |
| 1 | Track Foreman, at | 75.00 per month |
| 1 | Assistant foreman, at | 55.00 per month |
| 10 | Laborers' dumping cars | 16 cts. per hour |
| 38 | Laborers on track, at | 16 cts. per hour |
| 1 | Watchman, at | 45.00 per month |
| 1 | Timekeeper, at | 45.00 per month |
| 1 | Pumper, at | 45.00 per month |

*Night Shift.*

| | | |
|---|---|---|
| 1 | Steam shovel engineer, at | $125.00 per month |
| 1 | Steam shovel cranesman, at | 90.00 per month |
| 1 | Steam shovel fireman, at | 55.00 per month |
| 6 | Steam shovel pitmen, at | 20 cts. per hour |
| 1 | Conductor, at | 103.50 per month |
| 2 | Brakemen, at | 69.00 per month |
| 2 | Enginemen, at | 4.00 per day |
| 2 | Firemen, at | 2.40 per day |
| 1 | Assistant track foreman | 55.00 per month |
| 8 | Laborers, at | 1.75 per day |
| 1 | Watchman, at | 1.75 per day |
| 1 | Lightman, at | 1.75 per day |
| 1 | Pumper, at | 45.00 per month |

COST PER DAY.

| | Labor. | Supplies. | Total. |
|---|---|---|---|
| General foreman | $2.28 | ..... | $2.28 |
| Steam shovel service | 22.09 | $5.50 | 27.59 |
| Engine service | 22.08 | 9.00 | 31.08 |
| Car repairing | 4.40 | ..... | 4.40 |
| Dumping cars | 19.00 | ..... | 19.00 |
| Track foreman | 2.88 | ..... | 2.88 |
| Assistant track foreman | 2.11 | ..... | 2.11 |
| Track work | 62.70 | ..... | 62.70 |
| Timekeeper | 1.73 | ..... | 1.73 |
| Pumper | 1.73 | .65 | 2.38 |
| Watchman | 1.60 | ..... | 1.60 |
| Total | $142.60 | $15.15 | $157.75 |

COST PER NIGHT.

| | Labor. | Supplies. | Total. |
|---|---|---|---|
| Steam shovel supplies | $22.69 | $5.50 | $28.19 |
| Engine service | 22.08 | 9.00 | 31.08 |
| Assistant foreman | 2.11 | ..... | 2.11 |
| Dumping cars | 14.00 | ..... | 14.00 |
| Lighting | 1.75 | 2.34 | 4.09 |
| Pumping | 1.73 | .70 | 2.43 |
| Watching | 1.75 | ..... | 1.75 |
| Total | $66.11 | $17.54 | $83.65 |
| Total day and night | $208.71 | $32.69 | $241.40 |

PROGRESS.

| Month. | Yards Day. | Yards Night. | Yards Total. |
|---|---|---|---|
| May | 30,766 | ..... | 30,766 |
| June | 26,744 | 8,292 | 35,036 |
| July | 33,874 | 25,324 | 59,198 |
| August | 34,478 | 28,722 | 63,200 |
| September | 19,200 | 14,900 | 34,100 |
| October | 17,430 | 11,981 | 29,411 |
| Totals | 162,492 | 89,219 | 251,711 |

(All yardage cross-section measurements.)

COMMENT.

A comparative statement of the work done by company forces with that for which it could be contracted, is as follows:

If done by contractor with steam shovel outfit:

| | |
|---|---|
| 251,711 cu. yds. earth, at 26 cts. | $65,444.86 |
| Actual cost to the company | 47,140.30 |
| Saving | $18,304.56 |

The factor of time would also have had to be considered had the work been done this way.

It is the opinion of the writer that the cost of this work could have been materially reduced had twelve-yard dump cars been used instead of the five-yard. In the judgment of the writer, the five-yard car is too light in construction for the service required in handling heavy material, such as was handled on this work.

On account of complying with the enginemen's schedule, there was expended on this work $431.20, for which we received no service. This is about 10 per cent. of the cost of the supplies.

The cost of this work to the company could have been reduced somewhat if we had not been handicapped in being governed by schedules, and also if we had had the same freedom in the handling of labor, supplies and commissary as does the general contractor.

LITTLE SHOAL CUT-OFF.

The Little Shoal cut-off was a change of alinement and grades between Ayers and Durley, Ill. On this work there were handled 188,240 cubic yards of material.

A temporary trestle was built, having a total length of 2,142 ft., and an average height of 35 ft.

Material for the embankment was hauled an average distance of one-half mile.

The material handled was about 40 per cent. hardpan, it being about as hard a material as the shovel could dig without resorting to blasting.

On this work both shovel and engines were handled over 6 per cent. grades and 16-degree curves very easily.

*Equipment.*

1 65-ton Bucyrus steam shovel.
2 Switch engines (Class "E"), weight on drivers, 30 tons.
36 5-yd. dump cars.
1 Jordan spreader.

*General.*

| | |
|---|---|
| Date shovel commenced work | May 21 |
| Date shovel completed work | Sept. 30 |
| Date shovel commenced night shift | May 22 |
| Date shovel completed night shift | Sept. 30 |
| No. of days steam shovel on work | 133 |
| No. of nights steam shovel on work | 132 |
| Total | 265 |
| Total days worked by steam shovel | 96 |
| Total nights worked by steam shovel | 103 |
| Total days worked by steam shovel (10-hr. shift called a day) | 199 |
| Shovel laid up due to rains and Sundays (days) | 52 |
| Shovel delayed on account of moving shovel and shovel failure (days) | 14 |
| Percentage of the 199 days of shovel service delayed | 16 per cent. |
| Total car output, day shift | 29,774 |
| Total car output, night shift | 23,116 |
| Total | 52,890 |
| Cubic yards handled, day shift | 105,818 |
| Cubic yards handled, night shift | 82,422 |
| Total | 188,240 |
| Cubic yards per car | 3.56 |
| Cubic yards per day (10-hr. shift called a day) | 946 |
| Percentage of night-shift output to day-shift output | 78 per cent. |
| Length of haul, average distance | ½-mile |
| Material, where dumped | Temporary trestle |
| Kind of material | 39 per cent. hard-pan and clay |
| Condition of pit | Wet |
| Grand total cost of shovel work (labor) | $14,528.87 |
| Grand total cost of shovel work (supplies) | 3,607.38 |
| Total | $18,136.25 |
| Total cost per yard | .096 |

PROGRESS.

| Month. | Yards Day. | Yards Night. | Yards Total. |
|---|---|---|---|
| May | 9,724 | 5,251 | 14,975 |
| June | 32,268 | 25,364 | 57,632 |
| July | 25,778 | 19,883 | 45,661 |
| August | 24,018 | 20,602 | 44,620 |
| September | 14,077 | 11,275 | 25,352 |
| Totals | 105,865 | 82,375 | 188,240 |

(All yardage cross section measurements.)

Total yardage handled, 188,240, of which 39 per cent., or 72,900 cu. yds., would classify as loose rock, it being as hard a digging material as the shovel could stand without resort to blasting.

If done by contractor with steam shovel outfit:

| | |
|---|---|
| 188,240 cu. yds. at 26 cts. | $48,942.40 |
| Actual cost to company | 35,204.91 |
| Saving | $13,737.49 |

It is a certainty, had this work been let to a contractor, it would have been necessary to make some allowance on account of hard material, which would make the saving considerably more. Also, there is the factor of free transportation and freight, which would also be given them.

This cost includes all items of freight, supplies, labor and any others that are possible to include that should be charged to this work. It has been the intention in estimating same to get as close an estimate of actual cost to the company as possible.

SUMMARY.

The limits to which a shovel will work is a most important consideration in planning and estimating work of this kind. It is not economy to work the shovel to its extreme limit in lift and reach. The shovel used on this work, at times, loaded the 5-yd. cars on a loading track which was 9 ft. 2 in. higher than the shovel track, with the track centers 22 ft. Loading at such height is very slow work and is liable to wreck the cars badly on account of the lack of clearance for the return of the dipper after emptying.

When there is more than one cut to be made and where time is the all-important factor, 7 ft. difference in elevation between the shovel and loading tracks allows rapid work and gives better results.

In laying out steam-shovel work considerable can be saved at times by taking advantage of the natural conditions of the work as they exist. The track arrangement and the future track arrangements as the work progresses is a thing that is oftentimes neglected and causes serious delays to the shovel. On very few jobs has the writer seen the shovels work to their capacity, on account of poor track arrangement and the consequent inability to keep the cars to the shovel. One must have good running track over the entire work. With good track and proper arrangement, ideal conditions for a maximum shovel output are obtained.

## The Track Foreman.*

There were in 1905 about 326,000 employees in the Maintenance of Way and Structures department of American railroads, and close to 65,000 of these were foremen, on the basis of one foreman for every five employees. Of this body of foremen—equal numerically to the present enlisted strength of the United States Army—nearly 40,000 were section or track foremen. The balance, about 25,000, had charge of masons, plumbers, carpenters, bridgemen, painters, signalmen, etc., foreman of maintenance employees to every 1,250 inhabitants. Such is the foreman under discussion in point of

*Extracts from a paper read before the Engineers' Club of Philadelphia, June 2, 1906, by S. W. Kapp, Division Engineer of the Lehigh Valley, at Easton, Pa.

numbers. The Irish foreman is perhaps the type most familiar. In many cases he is almost illiterate, but he usually makes himself understood. We are all familiar with the story of the foreman who heeded his instructions to be brief in making his reports to his superior with such aptitude that the cut diamond, "Off again, on again, gone again, Finnegan," was given to us. Almost matching this in brevity is the telegram, "The cow that No. 3 killed yesterday is not dead yet, what shall I do with her? Michael Grady."

A foreman during an inspection of his territory by some of the officials representing a new management and a more liberal policy as to expenditures, was chided for the poor condition of his track in spite of extra expense incurred recently to secure improvement. He quickly made his excuse and at the same time turned the situation into a humorous one by remarking: "You should have been here when the trains were running on the shadow of the telegraph wire!" He further explained the previous conditions by alleging that had the fences not been in good shape at that time, the trains could not have been kept on the right of way.

While the Irish type is perhaps the most interesting the others are not uncommon, English, Dutch, German, Scandinavian, Italian and African examples being frequently met with. All have their good qualities. The types other than the Irish are usually found in communities where the particular nationality is or has been a very considerable portion of the population. It is often the case that the men under a foreman are of his nationality. Almost invariably the foreman begins his railroad career as a laborer on the lowest rung of the ladder. The laborer who displays an interest in his work and a tendency to act as a leader, is from time to time given charge of one or more men for odd jobs. If successful with such minor responsibilities, he is at last made a sub-foreman or assistant foreman. . . . The progression from laborer to foreman requires, even under favorable conditions, a considerable length of time, say from three or four years to as much as eight or ten.

This trade requires a knowledge of many things which comes only with long and patient experience with them, and the knowledge of many other things through association.

What are these things that are so difficult to master? The knowledge of the effect of temperature, wind, moisture, friction, chemical action, stress, motion of trains, and passage of time on the materials of construction and maintenance, and of the action to be taken to eliminate the effects of these ever-present agents. In addition, that almost sixth sense—railroad intuition—must be acquired thoroughly.

As some of these items are named, see how many you know how to combat; not what to suggest to try, but what if tried will surely answer the purpose.

*Temperature.*—Expansion and contraction of rail; breaking of telegraph wires in cold weather; frost heaving track unevenly; ice obstructing drainage lines; freezing of water lines and connections; breaking of rail in cold weather; the condensation of atmospheric moisture in the cups of oil lamps and on the relay and other contacts used in electric signal connections; the action of frost on exposed masonry, fences, poles, signals and signs; expansion and contraction of bodies of concrete or other masonry; formation of sleet on wires and signals; throwing down rocks in cuts; formation of ice in rock cuttings; fire in cinder banks and coal piles.

*Wind.*—Action on snow; on sand; on both mixed; on bodies of water; on floe ice; on fences, poles, signals and signs; or trees along the tracks; on fire on or near the right of way.

*Moisture.*—High water in large and small streams; cutting of embankments by current; undermining of masonry; softening of roadbed; landslides in cuts and on embankments; formation of ice jams; springs in cuts and under the roadbed; decreased insulation on wire lines for telegraph and signals.

*Friction.*—Surface and curve wear of rails; the cutting of rails into cross-ties and switch-ties; the cutting of spikes against the rail; the wear of switches and frogs; the wear of parts of an interlocking; ice or frost forming under the rails, decreasing the frictional resistance to spreading, and throwing more pressure against the spike.

*Chemical Action.*—Action of salt air and salt water from refrigerator cars, on rails, splices, spikes, bolts and fittings; on bridge iron, and paint also; effect of locomotive gases on structures; cars and maintenance of primary and storage batteries.

*Stress.*—Deterioration of iron and steel structures under vibration and loading; creeping of rails from wave motion under traffic; creeping and pulling of rail under changes of temperature; deterioration of rail, frog and switch fastenings under vibration and stress.

*Movement of Trains.*—Line and surface of track; superelevation of outer rail on curves; easements and runoffs of superelevation at ends of curves and points of compounding; maintenance of gage; adjustment of frogs, switches and switch stands; vertical curves at breaks in profile.

*Passage of Time.*—When cross-ties, switch-ties and ridge-ties have reached the point when they should be renewed; condition of timber in bridges and buildings on account of age; deterioration and renewal of ballast; deterioration of insulation on wires and cables; deterioration of underground pipes.

These are some, but not all, of the physical problems which at one time or another confront the foreman and demand some solution or palliation.

In addition the foreman must be posted on the operating rules, conditions and practices affecting the running of trains; he must acquire a general knowledge of the peculiarities of equipment and their effects on his work; he must become familiar with the requirements as to the shipment, receipt and inspection of material; he must learn to make repairs and renewals, and do his work without unnecessary interference with the movements of trains—the most of it must be done without any interference; learn to discriminate carefully between the many calls for his attention so as to take care of what is most important from an operating or maintenance standpoint, as the case may be; and maintain amicable relations with the railroad company's neighbors, his inferiors and superiors, and his fellow employees.

Is it any wonder that to attain a good working knowledge of the treatment of the major portion of these items requires years of experience? And is not recognized efficiency in the premises worthy of being classed skilled labor as much as any journeyman mechanic? And what do you suppose the compensation for such service is? From the statistical reports of the Interstate Commerce Commission, the section foreman averaged for 1903-1904 as little as $1.78 per day, or $53.40 per month. We know that track foremen have received as low as $40 per month and as high as $85 and $90 per month, according to location. It is, of course, understood that foremen of labor of other classes than trackmen receive generally better compensation.

The average wage of section foremen of $1.78 per day does not compare very favorably with other mechanics' wages of from $2 to $5 per day, according to trade and location. Attempts have been made by section foremen sporadically to form organizations to compel better wages. The necessary isolation of the men has, however, generally defeated such movements. It is manifestly difficult to secure cohesion and concentrated action when there is only one man for every six miles of railroad and one man per one hundred square miles of country.

This unfavorable comparison in the matter of compensation, coupled with inability to force recognition by combination, is driving the younger men into other occupations as laborers and apprentices. The effect of this is beginning to be painfully manifest. We see our foremen growing old with little or no material developing to fill the gaps. Unless the logic of the situation is realized by those in authority very shortly and the disparity of wages corrected voluntarily, it will be, and is already, a serious problem to know which way to turn for men willing and competent to continue the work of the maintenance of our railroads. They will, of course, be maintained after a fashion, but on a gradually descending scale of efficiency.

Mr. Kapp then goes on to rehearse the great variety of things that a track foreman has to look after, and continues:

This responsibility never ceases day and night, summer and winter, year in and year out. The mere recital of the many items of responsibility is of itself quite formidable. To live with them and under them for a term of years; to have them brought home to you one at a time or in groups by actual happenings—some of these happenings causing loss, damage, personal injury and death; to be haled before the courts in connection with litigation of claims for loss, damage and personal injury, and be examined and cross-examined as to these many items of responsibility and their bearing on the case in hand—truly the responsibility does not lessen. * * * Such is the burden of the foreman—in times of flood and high water; in extremes of temperatures; in blizzards and snowstorms—felt most keenly when others seek shelter from the elements; and with all this, inadequate compensation to him and the men under him.

At times the force available for doing the work required decreases either through inability to hire the necessary laborers on account of the low rate of pay, or through actual reduction of force to meet some necessity—temporary or otherwise—for decreased expenses.

In addition to the limitations as to the kind and amount of labor provided, the materials furnished for repairs and renewals are also restricted, sometimes temporarily and sometimes for considerable periods. Under such conditions the material that is furnished is often so grudgingly provided that it can almost be inferred that it is desred to let the property deteriorate.

How, then, does he get along? The work which is required to be done and for which he is responsible can be divided into a number of classes according to importance. Let us name a few: Necessary for safety; necessary for operation; necessary by statute and ordinance; necessary by deed requirement; necessary for proper maintenance; necessary for economical maintenance; necessary for appearances; necessary for improvement as to any one of the above; necessary to please the public; necessary to please individuals of

the public; necessary to please officials of the railroad; necessary to please individual railroad officials. When labor and materials are limited, the judgment of the foreman must assert itself and eliminate such items of work from his programme as cannot be accomplished. This elimination takes place even in violation of some of the many rules and instructions. As the rules and instructions can be divided into classes similar to those just mentioned in connection with work to be done, these violations necessary to keep the quantity of work within the labor available need not approach matters affecting safety, unless the limitations as to force and material are severe and long-continued. * * * It is safe to say that no road ever puts enough money into its maintenance to satisfy all the demands as to necessary work classified above. * * * The maintenance of the track of the railroads in the United States is accomplished with the labor of about one trackman per mile of track. Such a result is quite wonderful. One man working a little over three hundred ten-hour days per annum can replace the necessary cross-ties, rails, fastenings, frogs, switches, ballast, cut the grass and weeds, handle all the required material both new and old, keep the ditches open, adjust the fastenings, maintain the gage by respiking and adzing, raise a portion of the track, put in ballast, raise joints, surface track, maintain line of the rails, remove snow and ice, and take care of the hundred and one things demanding attention! This is made possible by what has come to be called "organization."

It is pertinent to consider how many units one man can effectively direct and control. Experience seems to indicate that from five to fifteen men represent the range, according to ability.

To illustrate the effect of organization on the efficiency of labor, this example will serve. The work was loading a certain class of material on railroad cars from the track level. The cars were placed on a long track, the material being piled alongside. A force of about one hundred men under one foreman loaded the material with shovels for a period. Later another group of men of about the same number were put at the same work. In this case there was a foreman for less than every ten men. The laborers were paid the same hourly rate in both cases, and were of the same class of men. The result was that notwithstanding the fact that the wages of the numerous foremen went into the labor cost of handling the material, the additional quantity loaded in the latter case was enough to keep the cost per ton of loading down a little more than half what it was in the first case. This is, of course, rather an unusual comparison. It shows plainly the benefit of closer supervision and control.

It will not be amiss to call attention to the similarity between the foreman and the engineer. Both start with material and labor and by proper combination produce the finished work. Both are by training, and should be by nature, leaders of men. The same necessities produced both. The foreman is an engineer. The engineer is a foreman. The largest success in life as far as engineers are concerned, seems to fall to those who can organize and lead men. Many never get beyond the consideration of things. Things without men are as nothing. Let us study men. Let us be foremen and we will be engineers. All honor to the foreman!

DISCUSSION.

Benjamin Franklin.—I have nearly always found that, as Mr. Kapp observed, most track foremen are old men. In personal contact with them, I have found that I could learn a good deal, especially in regard to the alinement of track, superelevation of the outer rail, and the fine art of laying special work.

William Gowie.—I once asked a track foreman how much expansion he allowed for that hot day (the temperature was 105 degs.), and he said: "We don't allow nothin'; we just push it together." Of course he was an Irishman. And I would like to know how many of these foremen know anything about stress and strain, temperature, motion, friction, etc., etc. There are very few foremen who can give you all the information you need. Their motto is generally: "Do the best you can."

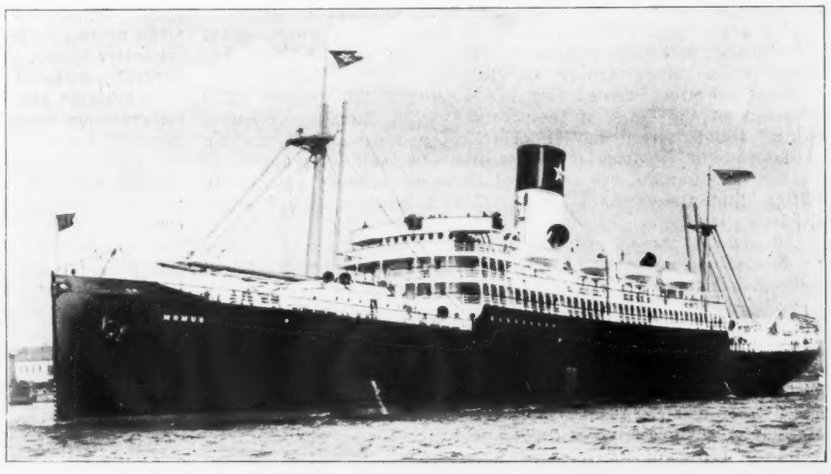
Mr. Kapp.—I believe that track foremen, as a body, know more about the proper elevation of the outer rail than do engineers. Engineers have developed the theory of the outer rail on the basis of centrifugal force. The foremen developed their theory of elevation from watching the trains go around the curves. Many a foreman will watch a track while the cars go by, and if the cars sway or oscillate he knows the job is wrong, and he works at it until he gets it right. As to the amount of elevation, it is always a compromise. The theoretical elevation of the outer rail is, ninety-nine times out of a hundred, wrong, in the case in hand, and the foreman can generally make a better adjustment than can the engineer.

Many foremen can put up better track and line than engineers. All the alining that need be done around a railroad can be accomplished by the use of a 2-ft. rule and a string about 100 or 125 ft. long. Stakes can be set out so that you can see before you start just how much a track is to be thrown, and all the obstacles to a correct line can be eradicated, and the cost can be reduced to a small amount, as compared with the cost of a corps of engineers to run a line as they think it ought to be run. I have seen foremen get very angry because some one attempted to tell them that he could better the line on a curve, and I doubt if many engineers could do it better than those same foremen, and put up superelevations and easements. I know of several 6-degree curves where trains are operated at speeds of sixty and sixty-five miles per hour without occasioning any comment or unpleasantness, these curves being maintained by foremen without the assistance of engineers.

Replying to the question as to what kind of men make the best foremen, I think that it has been the custom on several railroads in appointing foremen to select them from among their carpenters, they, as a rule, having had a range of experience which makes them very valuable.

## Southern Pacific Steamship "Momus."

The new Southern Pacific steamship "Momus" started her first regular trip from New York to New Orleans on December 12. Except for the engines, the "Momus" and the "Antilles" are sister ships of the twin screw turbine steamer "Creole," described in the *Railroad Gazette* of November 2. The "Momus" is 440 ft. long, 37 ft. deep from the upper deck and has 53 ft. beam. She draws, when loaded, 26 ft. Her dead weight carrying capacity is 4,500 gross tons; displacement, 16,000 gross tons, and gross tonnage about 7,000 tons. She has three double ended and four single ended boilers, whose working pressure is 234 lbs. The engines driving the single screw are triple expansion with cylinders 34 in., 57 in. and 104 in. in diameter with 63 in. stroke. She will carry 152 first-class passengers, 58 second class passengers and about 500 steerage passengers. The hull, which has a double bottom, is divided into 22 water tight compartments, and the cargo holds can carry about 335,000 cu. ft. of freight. The "Momus," as well as the "Antilles" and "Creole," is designed for a sea speed of 16 knots per hour.



New Southern Pacific Steamship "Momus."

The last word on the preservation of wood is supposed to have been said by Dr. Malenkovic, of Vienna, who has published a book on the subject (Die Holzkonservirung im Hochbau), which discusses the chemistry of wood, the organisms, vegetable and animal, which destroy it, the various means of preventing such destruction, and the present condition of the art of impregnating timber. Another scientific man, this time a Hungarian, Dr. Tuszon, has published a pamphlet on the organisms which destroy a single species of wood, the European red beech; but he has added a summary of the materials and methods now used for wood preservation, in which he says that it has only recently been found possible to secure a complete impregnation of heart timber with certain mineral salts, so that a reaction to tests can be had on fibers from any part cut out. Fluoride of iron, and especially fluoride of zinc, seem to be the salts he refers to. But even this author is said to have failed to describe the latest effective process, used by Wolman, who, to prevent the destructive effect on fibers of an excess of acids due to the decomposition of mineral salts, adds to the solution of salts a weak organic acid, such as acetate of ammonia, which can be done without any permanent precipitation. The free mineral acids are then converted into acetic acid, which does not injure the wood and soon evaporates.

# GENERAL NEWS SECTION

## NOTES.

Senator LaFollette, of Wisconsin, has introduced in Congress a joint resolution to require all railroads within one year to light mail cars with electricity.

The Canadian Pacific has made a reduction from four cents a mile to three and one-half cents in the passenger rates on certain of its lines west of Winnipeg, where business has rapidly increased.

Train robber Rumsey, who is credited with having robbed two passenger trains in Missouri in a single month, November 8 and November 25, has been brought to bar, pleaded guilty and been sentenced to 20 years' imprisonment.

The Chicago City Superintendent of Track Elevation, in his annual report says that since 1892 the railroads have raised the grade of 170 miles of main track in that city, and, including sidings and yards, 328 miles. The amount of money spent was $56,000,000.

Oliver & Company, the contractors who have been boring a tunnel through the Lookout mountain for the Southern Railway, report at Chattanooga that the tunnel, 3,600 ft. long, has been finished in 13 months and 15 days. This is claimed to be the record for quick work.

In connection with the coal shortage in the Northwest, reported in another column, it is said that the Duluth, Missabe & Northern has lent to the Northern Pacific 500 steel ore cars and eight locomotives to be used in hauling coal from Duluth to North Dakota to relieve the suffering in that state.

The New York Team Owners' Association has complained to the Interstate Commerce Commission that the Southern Pacific Company, at its freight receiving stations in New York City, discriminates in favor of Kelly & Buck, the trucks of this firm not being required to stand in line, as are those of the other parties bringing freight to the station.

The Interstate Commerce Commission has received a complaint against the Baltimore & Ohio from the Peabody Coal Company, alleging unfair distribution of coal cars for the past two years, and a similar one from the Powhattan Coal & Coke Company against the Norfolk & Western. In the last named it is charged that the Virginia coke makers are supplied with cars in proportion to their ovens, but as there are 11,000 ovens, while the market can be supplied by 5,000, there is gross inequality in the distribution of the cars, and a shipper, to get more cars, "must waste $500 on an unnecessary coke oven" for each additional car.

The Supreme Court of the United States, in a suit of the Alabama & Mississippi Railroad against the Railroad Commission of Mississippi, holds that the commission undoubtedly has the power to enforce equality in local rates; and continuing, says: While a state may not compel a railroad company to do business at a loss, and while a railroad company may insist, as aginst the powers of the state, upon the right to establish such rates as will afford reasonable compensation for the service rendered, yet when it voluntarily establishes local rates for some shippers, it cannot resist the power of the state to enforce the same rates for all. The state may insist upon equality as between all its citizens, and that equality cannot be defected in respect to any local shipments by arrangements made with or to favor outside companies.

The Delaware, Lackawanna & Western, which had already increased the pay of certain classes of men in the train service, has announced an advance of 10 per cent. on January 1, in the wages of station agents, telegraph operators and practically all employees in the transportation department not included in the former advance. The Louisville & Nashville has made an increase of about 4 per cent. in the wages of 2,000 shop men. The Central of New Jersey will increase the pay of trainmen and telegraph operators. The rate of increase is said to be 10 per cent. The New York, New Haven & Hartford, which has increased enginemen's pay 10 per cent., has advanced train despatchers from $25 a week to $27.50. The Lehigh Valley has increased the wages of employees in the transportation department from 10 to 20 per cent., beginning December 1.

In view of the complaints of car shortage, resulting, according to reports, in failure to transport the necessaries of life and coal for household use, the Interstate Commerce Commission on December 14 sent a telegram to the presidents of six northwestern railroads reciting that the commission is receiving numerous and importunate complaints of car shortage and failure to transport the necessaries of life, and that people are actually freezing because sufficient coal for household use cannot be procured. The commission therefore "urges you to make every possible effort to meet at once the needs and relieve the suffering of those dependent upon the facilities of your road." The six roads are the Great Northern, Northern Pacific, Minneapolis, St. Paul & Sault Ste. Marie, Chicago & North-Western, Chicago, Milwaukee & St. Paul, and Chicago, Burlington & Quincy. (See editorial pages.)

### Joining the Battery Tunnel.

The two shields of the north tube of the rapid transit tunnels under the East river from the Battery to the foot of Joralemon street, Brooklyn, met in the afternoon of December 14 and a party of engineers and workmen passed through from the New York end emerging in Brooklyn. On the 8th of December, while the shields were still 65 ft. apart, a 10-in. pipe was driven through and communication established to check up the surveys. The lines from each end varied less than a tenth of an inch. The south tube will probably be completed in six weeks. The Battery tunnels, or East river rapid transit tunnel extension, as it is known, will connect the present subway on Manhattan with the subway now building under Fulton street and Flatbush avenue in Brooklyn. The contract was originally let to Andrew Onderdonk in September, 1903. His death held up the work until the contract was transferred to the New York Tunnel Company, which has now completed part of the job. One of the most remarkable tunnel accidents on record occurred about a year ago in the Brooklyn heading. A bad blowout in front of the shield caught three men working there. One man in attempting to stop the hole was blown up through the river bottom and carried up above the water level by the spouting column of water. He was uninjured and kept afloat until rescued by a boat from the shore. The other two men escaped through the shield.

### Cape Cod Canal.

A controlling interest in the Boston, Cape Cod & New York Canal Co., which was organized to build a canal between Buzzard's Bay and Sandwich on Massachusetts Bay, has been acquired by August Belmont & Co., of New York. The old company had $6,000,000 authorized capital stock and $6,000,000 bonds, and the interests now in control expect to either increase the capital stock to $10,000,000 or to form a new company with that capital to take over the present company. William Barclay Parsons, formerly Chief Engineer of the New York Rapid Transit Commission, is to be in charge of the construction. The canal is to be without locks and will be 25 ft. deep at low water with a minimum width, at the bottom, of 125 ft., and, at the surface, of from 250 ft. to 300 ft. There are to be four long stretches 200 ft. wide at the bottom. The canal will be eight miles long, and it is expected that it will be opened for traffic within two and one-half years. Part of the right of way has been secured, surveys have been made, and application for permission to build has been made to the Massachusetts State Railroad Commission and the Massachusetts State Harbor and Land Board.

### New Advertising Manager of the Boston & Maine.

Walter H. Hayden, who for the last five years has been advertising agent of the Central of New Jersey, has been appointed Manager of the publicity and advertising departments of the Boston & Maine. Mr. Hayden began in the advertising department of the Boston & Maine 11 years ago, and became assistant advertising agent. He later went to the Central of New Jersey under C. M. Burt, then General Passenger Agent, and there, under Mr. Burt's direction, built up an efficient publicity and advertising department. Mr. Burt was made General Passenger Agent of the Boston & Maine last September, and Mr. Hayden now follows him.

### United States Steel Corporation Improvements.

The United States Steel Corporation announces the following details of the more important new construction authorized for 1907:

*Carnegie Steel Co.*—Ohio Steel Works—Two new blast furnaces; twelve open-hearth furnaces; blooming mill and bar mills of sufficient capacity to finish the product of the open-hearth plant. New mould foundry.

*Clairton Works.*—New 14-in. structural mill; new 22-in. structural mill; one 1,000-k.w. generator and gas engine.

*Duquesne Works.*—New 16-in. merchant bar mill; new electric power station.

*Bellaire Works.*—New river pumping plant.

*Indiana Steel Plant.*—Commencing work at Gary, Ind., on the second group of four blast furnaces, 28 open hearth furnaces, blooming and slabbing mills and other finishing mills sufficient to handle the steel produced.

*Illinois Steel Co.*—Construction of two 250-ton mixers for the Bessemer department; new 40,000,000-gal. pumping engine.

*National Tube Co.*—At Lorain works—One blast furnace and six open-hearth furnaces; new galvanizing plant.

*American Steel & Wire Co.*—New factory for the manufacture of insulating wire and cable at Waukegan works; extension to dock

at Central furnaces, Cleveland; new mill in Cleveland district for rolling flats for cold rolling; new rod mill at Worcester, Mass., plant.

*American Sheet Steel and Tin Plate Co.*—At the Guernsey works, four new hot mills; at New Philadelphia, Ohio, reconstruction of plant and addition of one jobbing mill and one sheet mill; at the Scottdale works, one new galvanizing plant and reconstruction of mills.

*Lorain Steel Co., Johnstown, Pa.*—Extensions and improvement that will practically double its capacity.

*American Bridge Co.*—New plant at Elmira, N. Y.

### New Japanese Steamships.

It is reported in Melbourne that the Nippon Yusen Kaisha (Japan Mail Steamship Company) is having built in Japan six steamships for the Australian trade, four of which are 8,500 tons each; also that the same company has placed orders in Kobé, Japan, for three steamers of 3,500 tons for the Yang-tse service, and two of 2,700 tons for the service between Japan and Shanghai.—*Consular Report.*

### Harbor Improvements for the Tehuantepec National.

The Mexican Congress has been asked to appropriate $10,000,000 to finish the harbor improvement works at Coatzacoalcos, the Atlantic terminus of the Tehuantepec National, and at Salina Cruz, the Pacific terminus. Contracts for these improvements were let five years ago, the total cost to be $32,500,000. So far, $20,000,000 has been spent, and the additional appropriation is asked to defray most of the cost of the rest of the work.

### Difficulties in Making Fast Time in Winter.

The railroads of Massachusetts are "up against it"—up against an order of the State Railroad Commission requiring them to report for one month—November 25 to December 25—the record of every passenger train arriving more than 10 minutes behind time, including, apparently, delays at way stations, even if they are made up before the train reaches the end of its run. Complaints are quite numerous and some of them have to do with suburban trains in the Boston district.

By way, perhaps, of heading off public criticism, or of mitigating the severity of passengers' complaints, somebody connected with the Boston & Albany has given to the *Springfield Republican* a column or two of his inmost thoughts concerning the troubles that afflict him. Whether or not this represents conditions on other roads also, we do not know, but it makes interesting reading either way. We quote a part only of this tale of woe:

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Passenger service on the three railroads which enter Springfield is poor these days, and there is small chance that it will be materially better before spring. Almost every through train between New York and Springfield and between Albany and Boston has come to a habit of rolling in anywhere from 5 to 30 minutes late. The through trains from Chicago are rarely less than half an hour behind time, and often one of them is over 2½ hours late. The unparalleled freight business is the principal cause of trouble for the Boston & Albany. Immense quantities of export freight are being rushed into every junction point. Almost every factory along its lines has greatly increased its output, and on every side factories are springing up at a rate undreamed of a year ago. The road has not been able to prepare to handle this huge volume of business, and so is staggering along trying to do a four-track business with two tracks. To-day freight yards are full of cars, other roads must hold back cars which they would gladly deliver to the Boston & Albany, the road is full of freight trains trying to get along and keep out of the way of passenger trains and of passenger trains trying to dodge freight trains and keep up to scheduled running time. A state of affairs which forces the road's general superintendent to give almost every minute of his time to untangling blockades in freight yards is serious, especially when it comes at the beginning of winter. The difficulty of shipping freight at all, to say nothing of getting it delivered, is bringing about a change in express shipments. Many manufacturers are shipping by express heavy cases, which formerly went by freight, and the result is delay after delay at stations, for the express car employees cannot throw out or load as rapidly as time tables require.

The Boston & Albany has barely enough engines to keep freight moving, and there is no prospect that the 22 new engines ordered will arrive before spring, so day after day freights get in the way of passenger trains and schedules are continually being deranged. The situation will apparently be gotten well in hand, when, behold, two freights arrive at a siding and start to get out of the way of a passenger train only to find that there is not room enough to accommodate them. Consequently, the passenger train must stop and allow one freight to run around it. The delay is perhaps 10 minutes, but it is sufficient to start things going wrong, and soon, according to the railroad law of cumulative troubles, the whole system has been thrown out of gear, yards are piling full of freight cars, shippers are "kicking," and train despatchers are frothing at the mouth.

Another fruitful cause of delays and loss of time is scarcity and poor quality of coal. The Boston & Albany is living from hand to mouth, and the New Haven road is little better off. The Boston & Maine has a supply of good coal for its passenger engines, but is forced to use a poor quality in its freight engines. There is being used, of sheer necessity, in Boston & Albany passenger and freight engines coal of a quality such as formerly was not considered fit for switch engines. Some it is mottled with clay; some is part shale; much of it is part dust. Last May the road had a 60-day supply of coal; to-day that surplus has been wiped out and the road's 270 engines, which eat up 48,000 tons of coal every 30 days, would be practically useless were the Albany end of the road to be tied up by snow for two days. There is an alarming scarcity of coal at the Great Lake ports, and the mines are shipping coal to these cities as fast as they can, and are obtaining better prices than they can in the East. Accordingly, eastern consumers, whether they be railroads or manufactories, are having great difficulty in securing a coal surplus, and the mines are mining outcroppings, anything that looks like coal, and are shipping some stuff that clogs grates, won't make steam fast and is fit for the dump. Only recently the Boston & Albany tried to place large orders with the Pocahontas and New River companies, which send out fine steaming coal, but neither company would consider an order.

A spell of zero weather causes a railroad more trouble than 10 inches of snow, for snow can be plowed out, while chilly weather bothers the engines until it moderates. Zero temperatures solidify the lubricants in the journal boxes, so that the engines must drag against a stiffer pullback. They necessitate the waste of much steam in warming cars and the leakage of more from coupling joints in the steam hose. They interfere with the engine drafts, and one end of fireboxes is hotter than the other, causing leaky tubes from unequal expansion. In very cold weather the engineers take time to muffle up before stepping down at stations; they move slowly as they oil and inspect. Passengers, stiff from waiting on exposed platforms or shrinking from the cold air, move slowly, and, fearing falls, mount and descend the car steps slowly. The baggage and express car crews must work with chilled fingers, and so lose time. In the aggregate these many causes of delays are responsible for much of the poor passenger service in winter. When the temperature drops to 20 degrees above zero, with prospect of further drops, the order goes out to make up freight trains 100 tons short of ordinary loads. As the mercury drops another 10 degrees an order for the dropping of 50 more tons goes out, and by the time the mercury has fallen to zero, trains are hauling but 75 per cent. of their summer loads. This means that five trains are required to do the work of four, and that more train units are scattered along the road to get in the way of each other.

The union station in this city is a fruitful cause of long delays. The trains of three roads must pull into it, and frequently it happens that three or four arrive about the same time and that the two rearmost must wait until the way is clear. The rearmost train is sure to be delayed 20 minutes. The stiff grades and bad curves on the Boston & Albany through the hilly districts do not allow more than a certain speed, and with most of the trains running about as near the limit of safe speed as possible, the chances of regaining lost time in the 200 odd miles between Albany and Boston are poor.

### A Collection of Incandescent Electric Lamps.

The Franklin Institute has published a committee report on a historical collection of incandescent lamps made and exhibited at the St. Louis Exposition of 1904 by William J. Hammer. The collection, a photograph of which is reproduced in the report, is most interesting. It was started in 1879 and now consists of over 1,000 lamps, each of which marks an important step in the development of the art. It covers the period from 1878 to 1904.

## TRADE CATALOGUES.

*Packings.*—The Crandall Packing Company, Palmyra, N. Y., has issued a catalogue and price list of packings suited to pipes carrying ammonia, gas, steam and water. The company makes ring and coil packing, and also sheets of compound and asbestos reinforced with wire. The catalogue also describes valves, washers, hose, belting and other specialties.

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*Uintah Railway.*—The passenger department of the Denver & Rio Grande is distributing an attractive pamphlet describing the territory served by one of its subsidiary roads, the Uintah Railway. This is a narrow gage road running from a junction with the Rio Grande Western at Mack, Colo., north, 54 miles, to Dragon, Utah. It traverses a most picturesque region, starting in the valley of the Grand river, where arid land has been successfully irrigated, and running from there to good hunting country.

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*Graphite.*—The December issue of *Graphite* published by the Joseph Dixon Crucible Company contains two interesting testimonials to the efficiency of Dixon graphite air-brake and triple valve grease; one is from an engineman, and the other from a railroad

officer who made comparative tests of this lubricant and another compound.

*Couplers.*—The McConway & Torley Company, Pittsburg, Pa., has issued a catalogue showing all draft gears made by it. These products include the Janney-Miller, Janney-Buhoup, Buhoup-Miller couplers, as well as Janney couplers for tenders and locomotives, Kelso pilot and tender couplers, Pitt tender couplers and Buhoup vestibule equipment. Each equipment is clearly described and every part is illustrated and listed. The book, which is 9 in. x 12 in., is bound in cloth. The index is exceptionally good, covering all the details.

### Manufacturing and Business.

The Sullivan Machinery Company, Chicago, has opened a branch office and warehouse at 319 Howard street, San Francisco, Cal. Howard T. Walsh will be manager of the branch.

Robert E. Slagle, for the past three years assistant district superintendent of the Pullman Company at Kansas City, Mo., has gone, as half owner, to the Acme Supply Co., 100 Lake street, Chicago.

The Peoples Line, which operates steamships on the Hudson river between New York and Albany, has ordered a 440-ft. steamboat. The hull will be of steel and the boat will have sleeping capacity for about 2,500 passengers.

Aaron Dean, Jr., heretofore Resident Manager of the Western district of the Federal Railway Signal Company, with office at Chicago, has been made Chief Engineer of the company, with office at its works, Troy, N. Y., succeeding P. G. Ten Eyck, who was recently appointed General Manager of the company at Troy. W. W. Lavarack, assistant to the President, will succeed Mr. Dean, with office at Chicago, in charge of the Western district of the company.

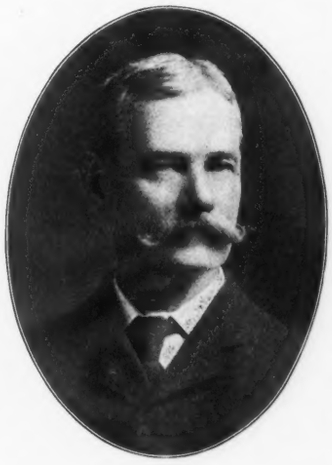
### Iron and Steel.

The Texas Railway has ordered 19,000 tons of rails; the Great Northern, 15,000 tons additional; the Spokane Inland, 7,000 tons, and the Chicago, Indianapolis & Louisville, 5,000 tons.

The Harriman Lines are reported to be in the market for about 35,000 tons of rails. Other roads are trying to buy about 12,000 tons, and electric lines about 5,000 tons. The Georgia Southern & Florida recently gave an order for 32,000 tons to the Pennsylvania Steel Co.; the Detroit, Toledo & Ironton has ordered 6,000 tons; the Duluth & Northern Minnesota 1,000 tons, and the Pacific Traction 1,000 tons. Contracts are pending for structural material to be used on the New York Central between Forty-fifth and Fiftieth streets, New York City.

## OBITUARY NOTICES.

Col. George B. Nicholson, Chief Engineer of the Cincinnati, New Orleans & Texas Pacific, died on December 2 at Covington, Ky. Col. Nicholson was born in 1840 and came to this country when a young man. He served through the Civil War, and then went to Idaho, where he built wagon roads. He was later in charge of lighthouse building on the Gulf of Mexico, and then went into the Phoenix Bridge Company. He later built the New Orleans & Northeastern. Col. Nicholson was a close friend of the late President Samuel Spencer of the Southern, and of John F. Wallace, formerly Chief Engineer of the Isthmian Canal Commission. Some years ago Col. Nicholson refused the offer of the French Government to make him Chief Engineer of the Panama Canal.



G. B. Nicholson.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)*

### Franklin Institute.

At a stated meeting of the institute December 19 the program included an address on "The Chesapeake and Delaware Canal," by Prof. Lewis M. Haupt.

### American Society of Civil Engineers.

At a meeting of this society December 19 a paper on "Recent Practice in Hydraulic-Fill Dam Construction," by James D. Schuyler, was presented for discussion. This paper was printed in "Proceedings" for October, 1906.

### Canadian Society of Civil Engineers.

At a meeting of this society, December 13, a paper, "The Description of Stress in Riveted Connections," by C. R. Young; also one, "An Investigation on the Value of the Indentation Test for Steel Rails," by H. K. Dutcher, was read.

## ELECTIONS AND APPOINTMENTS.

### Executive, Financial and Legal Officers.

*Bangor & Aroostook.*—Percy R. Todd, who recently resigned as First Vice-President of the New York, New Haven & Hartford, has been elected Vice-President of the Bangor & Aroostook.

*Peoria & Pekin Terminal.*—See Peoria Railway Terminal.

*Peoria Railway Terminal.*—The officers of this road, recently incorporated to, presumably, succeed the Peoria & Pekin Terminal, are as follows: T. A. Grier, President; W. J. Zonzelman, Vice-President; Frederick H. Smith, Treasurer; Theodore J. Miller, General Manager; William Jack, Secretary and Auditor, and William J. Jack, Counsel.

*Seaboard Air Line.*—L. Sevier, General Freight Agent of the Alabama Great Southern, has been elected Second Vice-President and Traffic Manager of the Seaboard Air Line, effective January 1, succeeding E. F. Cost, resigned to go to the Kansas City Southern.

*Southern.*—John M. Culp, Third Vice-President, has been elected Second Vice-President, succeeding W. W. Finley, promoted. C. H. Ackert, Fourth Vice-President, has been elected Third Vice-President; T. C. Powell, Fifth Vice-President, has been elected Fourth Vice-President; H. B. Spencer, Sixth Vice-President, has been elected Fifth Vice-President. Fairfax Harrison, Assistant to the President, has been elected Vice-President, assisting the President in matters of finance and such other duties as may be referred to him.

*Tehuantepec National.*—W. B. Ryan, General Traffic Manager, has been elected Vice-President, with office at Rincon Antonio, Mex.

### Operating Officers.

*Augusta & Florida.*—J. M. Turner, General Manager of the Raleigh & Charleston, has been appointed General Manager of the Augusta & Florida; the Douglas, Augusta & Gulf; the Millen & Southwestern, and the Valdosta Southern, succeeding Cecil Gabbett, resigned.

*Baltimore & Ohio.*—O. H. Hobbs, Superintendent at Connellsville, Pa., has been appointed Superintendent at Baltimore, Md., succeeding C. W. Galloway, promoted. J. J. Driscol, Trainmaster at Connellsville, succeeds Mr. Hobbs.

See Baltimore & Ohio Southwestern.

*Baltimore & Ohio Southwestern.*—W. M. Greene, General Manager, has resigned, effective January 1. C. C. F. Bent, General Superintendent of the Baltimore & Ohio at Baltimore, Md., succeeds Mr. Greene, with office at Cincinnati, Ohio.

*Canadian Pacific.*—James Oborne, General Superintendent of the Eastern division, has been appointed General Superintendent of the Ontario division, with office at Toronto, succeeding H. P. Timmerman, who takes Mr. Oborne's place at Montreal, Que. The Ontario division will hereafter be operated in three districts. J. R. Nelson is Superintendent of the First district, from Toronto east to Smith's Falls, with office at Toronto. C. Murphy, Superintendent at Toronto, Ont., has been appointed Superintendent of the Second district, from Toronto west to Windsor, with office at London, Ont. A. L. Smith has been appointed Superintendent of the Third district, which comprises lines north of Toronto.

*Chicago & North-Western.*—Frank Walters, Assistant General Manager of the lines west of the Missouri river, has been appointed General Manager, with office at Omaha, Neb., succeeding G. F. Bidwell, resigned on account of ill health.

*Chicago, Rock Island & Pacific.*—D. E. Cain, General Manager of the Southwestern and Choctaw districts, has resigned, effective January 1, and the office has been abolished. The authority of F. O. Melcher, General Manager of the Central and Northern districts, will be extended to include the duties now performed by Mr. Cain.

A. B. Ramsdell has been appointed Trainmaster of the West Iowa division, with office at Des Moines, Iowa, succeeding F. M. Patt, transferred to the Illinois division.

*Denver & Rio Grande.*—A. E. Welby, General Superintendent, has resigned, effective January 1, to go into other business.

*Douglas, Augusta & Gulf.*—See Augusta & Florida.

*Grand Trunk.*—W. E. Costello, Assistant Superintendent at Battle Creek, Mich., has resigned to go to the Oregon Short Line.

*Kansas City Southern.*—See Rio Grande Western.

*Louisville & Nashville.*—J. M. Teague, Assistant Trainmaster at Birmingham, Ala., has been appointed to the new office of Assistant Superintendent at Anniston, Ala.

*Millen & Southwestern.*—See Augusta & Florida.

*Missouri Pacific.*—W. E. Merrifield, Trainmaster at Concordia, Kan., has been transferred to Sedalia, Mo., succeeding J. E. Snedecker, promoted. C. W. Benedict succeeds Mr. Merrifield.

*New York Central & Hudson River.*—F. E. McCormack, Chief Trainmaster of the Rome, Watertown & Ogdensburg division, has been appointed to the new position of Assistant Superintendent of that division, with office at Watertown, N. Y.

*Norfolk & Southern.*—J. A. Glassford has been appointed Trainmaster of the Norfolk and Pamlico divisions, with office at Edenton, N. C.

*Raleigh & Charleston.*—See Augusta & Florida.

*Rio Grande Western.*—B. A. Campbell, Assistant Superintendent at Salt Lake City, has been appointed Trainmaster at Helper, Utah. E. H. Holden, Trainmaster of the Kansas City Southern at Shreveport, La., succeeds Mr. Campbell.

*Valdosta Southern.*—See Augusta & Florida.

### Traffic Officers.

*Alabama Great Southern.*—See Seaboard Air Line under Executive, Financial and Legal Officers.

*Cleveland, Cincinnati, Chicago & St. Louis.*—C. J. Brister, Assistant General Freight Agent at Cincinnati, Ohio, has been appointed General Freight Agent, succeeding George H. Ingalls, promoted.

*Delaware, Lackawanna & Western.*—F. P. Fox, Division Passenger Agent at Buffalo, has been appointed Industrial Agent and Advertising Manager, effective January 1, succeeding W. P. Colton, resigned.

*Georgia Railroad.*—C. C. McMillen has been appointed Assistant General Passenger Agent, with office at Augusta, Ga.

*Great Northern.*—S. J. Allison, General Agent at Chicago, has been appointed Assistant General Passenger Agent, succeeding S. G. Yerkes, promoted several months ago.

*Kansas City Southern.*—C. W. Nunn has been appointed Industrial Agent of this company and of the Texarkana & Fort Smith, with office at Kansas City, Mo.

*Lake Shore & Michigan Southern.*—J. W. Daly, Chief Assistant General Passenger Agent, has been appointed General Passenger Agent, with office at Cleveland, Ohio.

*Michigan Central.*—Carl Howe, Assistant General Freight Agent at Buffalo, N. Y., has resigned, effective January 1, to become Traffic Manager of the Merchants' Despatch Transportation Company, succeeding H. B. Tindall, resigned.

*Texarkana & Fort Smith.*—See Kansas City Southern.

### Engineering and Rolling Stock Officers.

*Central of Georgia.*—W. E. Chester, General Master Mechanic, has resigned, and the position has been abolished. F. F. Gaines, who, as noted last week, has been appointed Superintendent of Motive Power, succeeds to the duties heretofore performed by Mr. Chester.

*Duluth, Missabe & Northern.*—C. W. Seddon, Superintendent of the Great Northern shops at Superior, Wis., has been appointed Superintendent of Motive Power and Cars of the Duluth, Missabe & Northern, with office at Proctor, Minn.

*Kansas City Terminal.*—John V. Hanna, Assistant Engineer of Maintenance of Way of the St. Louis & San Francisco, has been appointed Chief Engineer of the recently organized Kansas City Terminal.

*St. Louis & San Francisco.*—See Kansas City Terminal.

*Southern.*—A. Stewart, Mechanical Superintendent, has been appointed to the new office of General Superintendent of Motive Power and Equipment, with office at Washington, D. C., and his former position has been abolished.

## LOCOMOTIVE BUILDING.

*The Norfolk & Western* has ordered 100 freight locomotives.

*The Colorado & Southern* has ordered 32 locomotives from the Baldwin Locomotive Works.

*The Harriman Lines* are figuring on 100 additional locomotives with the Baldwin Locomotive Works.

*The Atlanta, Birmingham & Atlantic* has ordered 25 locomotives from the Baldwin Locomotive Works.

*The New Orleans Great Northern* has ordered two freight locomotives from the American Locomotive Company,

*The Buffalo & Susquehanna* has ordered four freight and two passenger locomotives from the Baldwin Locomotive Works.

*The Des Moines Union* is figuring on buying one six-wheel switching locomotive from the Baldwin Locomotive Works.

*The United Railways of Yucatan* will shortly be in the market for locomotives. The New York purchasing agents are Thebaud & Company.

*The Chicago, Burlington & Quincy* has ordered 50 Prairie (2-6-2) locomotives and 15 Pacific (4-6-2) locomotives from the American Locomotive Company.

*The Toledo & Ohio Central* has ordered five consolidation (2-8-0) locomotives and three six-wheel switching (0-6-0) locomotives from the American Locomotive Co.

*The Great Northern* has ordered from the Baldwin Locomotive Works for 1907 delivery 25 Mallet compounds, 100 Prairie (2-6-2) type locomotives and 15 Atlantic (4-4-2) type balanced compounds. Possibly some of these last will be Pacific (4-6-2) type.

*The Hocking Valley* has ordered five consolidation (2-8-0) locomotives, five six-wheel switching (0-6-0) locomotives and two locomotives for passenger service from the American Locomotive Co. The specifications for these locomotives are not yet completed.

*The Danville & Western* has ordered two simple 10-wheel (4-6-0) locomotives from the American Locomotive Co., for February, 1907, delivery. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Types of locomotive | Ten-wheel |
| Weight, total | 140,000 lbs. |
| Weight on drivers | 110,000 " |
| Diameter of drivers | 56 in. |
| Cylinders | 19 in. x 26 in. |
| Boiler, type | Wagon top |
| " working steam pressure | 200 lbs. |
| " number of tubes | 290 |
| " diameter of tubes | 2 in. |
| " length of tubes | 15 ft. 6 in. |
| Tank capacity | 4,500 gals. |
| Coal capacity | 10 tons |

*The Chesapeake & Ohio* has ordered eight simple Pacific (4-6-2) locomotives and seven simple Atlantic (4-4-2) locomotives from the American Locomotive Co. The specifications are as follows:

*General Dimensions.*

| | Pacific. | Atlantic. |
|---|---|---|
| Type of locomotive | | |
| Weight, total | 211,000 lbs. | 179,000 lbs. |
| Weight on drivers | 158,000 lbs. | 102,000 lbs. |
| Diameter of drivers | 72 in. | |
| Cylinders | 22 in. x 28 in. | 21 in. x 26 in. |
| Boiler, type. | Straight; wide firebox. | |
| " wrkg. stm. pressure | 200 lbs. | |
| " number of tubes | 310 | 396 |
| " material of tubes | Seamless steel | |
| " diameter of tubes | 2¼ in. | 2 in. |
| " length of tubes | 19 ft. 6 in. | 16 ft. |
| Firebox, length | 90 in. | 96⅛ in. |
| " width | 75 in. | 75⅝ in. |
| " material | Worth steel. | |
| " grate area | 47.9 sq. ft. | 50.2 sq. ft. |
| Heating surface, total | 3,755.0 " | 3,478.0 " |
| Tank capacity | 7,000 gals. | |
| Coal capacity | 9 tons. | |

*Special Equipment.*

| | |
|---|---|
| Air-brakes | Westinghouse |
| Bell ringer | Golmar |
| Brake-shoes | "Perfecto" |
| Couplers | Tower |
| Headlights | Pyle-National |
| Injector | Hancock |
| Safety valve | Consolidated |
| Sanding devices | Leach |
| Sight-feed lubricators | Nathan |
| Steam heat equipment | Safety |
| Tires, driving wheel | Latrobe |
| " truck wheel | " |
| " tender wheel | " |
| Other specialties | Brewer fire door opener |

*The Great Northern* is building 10 simple six-wheel switching (0-6-0) locomotives at its Dale street shops, St. Paul. The specifications are as follows:

*General Dimensions.*

| | |
|---|---|
| Type of locomotive | Switching |
| Weight, total | 135,000 lbs. |
| Diameter of drivers | 49 in. |
| Cylinders | 19 in. x 26 in. |
| Boiler, type | Belpaire |
| " working steam pressure | 200 lbs. |
| " number of tubes | 291 |
| " material of tubes | Shelby steel |
| " diameter of tubes | 2 in. |
| " length of tubes | 11 ft. 3 in. |
| Firebox, length | 98 in. |
| " width | 40 " |
| " grate area | 27.22 sq. ft. |
| Heating surface, total | 1,873.5 " |
| Tank capacity | 4,000 gals. |
| Coal capacity | 6 tons |

*Special Equipment.*

| | |
|---|---|
| Bell ringer | "Little Giant" |
| Boiler lagging | Magnesia |
| Brake-beams | Great Northern standard |
| Brake-shoes | Great Northern standard |
| Couplers | Tower |
| Headlights | Adams & Westlake |
| Injector | Ohio |
| Journal bearings | Great Northern standard |
| Piston rod packings | " " " |
| Valve rod packings | " " " |
| Safety valve | Ashton |
| Sanding devices | Leach |
| Sight-feed lubricators | Detroit |
| Springs | Simplex |
| Steam gages | Ashton |
| Tires, driving-wheels | Standard steel |
| " truck wheel | " " |
| " tender wheel | " " |
| Wheel centers | American Steel Foundries |

*The Vandalia* is asking bids on 12 simple freight mogul (2-6-0) locomotives, two simple Atlantic (4-4-2) locomotives and six simple six-wheel switching (0-6-0) locomotives from the American Locomotive Co. and the Baldwin Locomotive Works. The specifications are as follows:

*General Dimensions.*

| | Mogul. | Atlantic. |
|---|---|---|
| Types of locomotive | Mogul. | Atlantic. |
| Weight, total. | 187,000 lbs. | 181,500 lbs. |
| Weight, on drivers | 159,300 " | 105,600 " |
| Diameter of drivers | 63 in. | 79 in. |
| Cylinders | 21 in. x 28 in. | 21 in. x 26 in. |
| Boiler, type. | Straight. | |
| " wkg. st'm pressure. | 200 lbs. | |
| " number of tubes.. | 390 | 351 |
| " diameter of tubes.. | 2 in. | |
| " length of tubes | 161⅞ in. | 190⅞ in. |
| Firebox, length | 108⅛ " | 96½ " |
| " width | 69¼ " | 75¼ " |
| " material | Pennsylvania R. R. specifications. | |
| " grate area | 52 sq. ft. | 50.2 sq. ft. |
| Heating surface, total | 2,935 sq. ft. | 3,100.3 sq. ft. |
| Tank capacity | 7,500 gals. | |
| Coal capacity | 24,000 lbs. | |

| | |
|---|---|
| Type of locomotive | Switching |
| Weight, total | 144,000 lbs. |
| Diameter of drivers | 51 in. |
| Cylinders | 20 in. x 26 in. |
| Boiler, type | Straight |
| " working steam pressure | 180 lbs. |
| " number of tubes | 311 |
| " diameter of tubes | 2 in. |
| " length of tubes | 131 " |
| Firebox, length | 108 3/16 " |
| " width | 41¾ " |
| " grate area | 31.4 sq. ft. |
| Heating surface, total | 1,955.1 " |
| Tank capacity | 5,000 gals. |
| Coal capacity. | 15,000 lbs. |

## CAR BUILDING.

*The Erie* is asking bids on 4,000 steel hopper and 3,000 box cars.

*The Atlanta, Birmingham & Atlantic* is receiving bids on 300 coal cars.

*The Texas Southern* has bought 50 box cars of 50,000 lbs. capacity.

*The Boston & Albany* has ordered two cafe coaches from the Pullman Company.

*The New York, Chicago & St. Louis* is reported to be figuring on passenger equipment.

*The Northern Pacific* has ordered 1,000 steel gondolas from the Pressed Steel Car Company.

*The Atchison, Topeka & Santa Fe* has ordered one parlor car from the Pullman Company.

*The Chicago, Burlington & Quincy* has ordered four dining cars from the Pullman Company.

*The Delaware & Hudson* has ordered 400 freight cars from the American Car & Foundry Co.

*The Pennsylvania* has ordered 2,500 underframe box cars from the Pressed Steel Car Company.

*The Missouri & North Arkansas* has ordered 30 freight cars from the American Car & Foundry Co.

*The Northern Electric Company*, Chico, Cal., is reported as in the market for about 10 passenger cars.

*The United Verde & Pacific* has ordered 20 flat cars of 40,000 lbs. capacity from the Pullman Company.

*The South & Western* has ordered one 60-ft. first class passenger coach from the Hicks Locomotive & Car Works.

*The Toledo, Peoria & Western* has ordered 50 gondola cars of 80,000 lbs. capacity from the Pullman Company.

*The Missouri, Kansas & Texas* has ordered about 14 passenger cars from the American Car & Foundry Company.

*The Somerset Coal Company* has ordered about 1,000 hopper cars from the Baltimore Steel Car & Foundry Company.

*The National of Mexico* has ordered 565 steel-frame box and gondola cars from the American Car & Foundry Company.

*The Grand Trunk*, as reported in our issue of November 23, has ordered 400 refrigerator cars from the Mt. Vernon Car Company.

*The New Orleans Great Northern* has ordered 300 steel underframe flat cars of 80,000 lbs. capacity from the Pressed Steel Car Company.

*The United Railways of Yucatan* will shortly be in the market for passenger cars. The New York purchasing agents are Thebaud & Company.

*The American Smelting & Refining Company* has ordered 90 tank and mining cars from the American Car & Foundry Company for use in Mexico.

*The Lehigh Valley*, as reported in our issue of December 14, has ordered from the Standard Steel Car Co. 1,000 additional steel underframe box cars.

*The Baltimore & Ohio* has ordered three cafe parlor cars from the Pullman Company. These cars will be 81 ft. long and are to be delivered next spring.

*The Seaboard Air Line*, it is reported, has ordered 1,000 ventilated box cars for July and August, 1907, delivery, and expects to build 50 additional flat cars at its own shops.

*The Buffalo, Rochester & Pittsburg* has ordered 500 all-steel hopper cars of 100,000 lbs. capacity from the Standard Steel Car Company, and 500 box cars of 60,000 lbs. capacity from the American Car & Foundry Company. These are the cars referred to in our issues of November 30 and December 14.

*The Harriman Lines*, as reported in our issue of December 14, have ordered five dining cars for the Southern Pacific, two dining cars for the Louisiana Western, one dining car for Morgan's Louisiana & Texas and one dining car for the Texas & New Orleans from the Pullman Co., for December, 1906, and February, 1907, delivery. These cars will be 70 ft. long, 9 ft. 8 in. wide, over all, and 14 ft. 9 in. high over kitchen smoke jack.

*The Chicago Great Western* has ordered 300 box cars of 70,000 lbs. capacity from the Pullman Company. These cars will weigh 36,000 lbs. and will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, all inside measurements. The special equipment includes:

| | |
|---|---|
| Brakes | Westinghouse |
| Couplers | Janney |
| Doors | Security |
| Roofs | Chicago |
| Trucks | Barber |
| Wheels | Griffin |

*The Pittsburg & Eastern Coal Co.* (M. A. Hanna & Co.), Cleveland, Ohio, has ordered 500 steel hopper cars of 100,000 lbs. capacity from the Cambria Steel Co., for July, 1907, delivery. These cars will weigh about 38,000 lbs., and will measure 30 ft. 5 in. long, 9 ft. 6 in. wide and 10 ft. 9 3/16 in. high, inside measurements. The special equipment includes:

| | |
|---|---|
| Bolsters | Pressed Steel Car Co. |
| Brake-beams | Simplex |
| Couplers | Tower |
| Draft rigging | Westinghouse |

*The New York, New Haven & Hartford*, as reported in our issue of November 16, has ordered from the American Car & Foundry Company 500 refrigerator cars of 60,000 lbs. capacity. These cars will measure 29 ft. 8¼ in. long, 8 ft. 4¼ in. wide and 7 ft. 11½ in. high, inside measurements, and 37 ft. 3½ in. long, 9 ft. 5 in. wide, and 13 ft. 3¼ in. high, over all. The bodies will be of wood and the underframes of metal. The special equipment includes:

| | |
|---|---|
| Axles | Open-hearth steel |
| Bolster (truck) | American Steel Foundry |
| Brakes | Westinghouse |
| Brasses | Magnus Metal Co. |
| Couplers | Climax |
| Draft rigging | Sessions friction, Type C |
| Journal boxes | Franklin |
| Trucks | Diamond |

*The Chicago, Lake Shore & Eastern*, as reported in our issue of December 14, has ordered 200 steel underframe side dump gondolas, 175 steel side dump and 100 steel underframe flat cars, all of 100,000 lbs. capacity, from the American Car & Foundry Co. The steel underframe gondolas will weigh 40,600 lbs., and will measure 33 ft. 5 in. long, 8 ft. 6 in. wide and 8 ft. 8½ in. high, inside measurements. The dump cars will weigh 48,000 lbs., and will measure 40 ft. long, 10 ft. wide and 10 ft. high, inside measurements. The flat cars will weigh 34,000 lbs., and will measure 36 ft. long, 8 ft. 6 in. wide and 4 ft. high. The special equipment for all includes:

| | |
|---|---|
| Axles | Illinois and Carnegie steel. |
| Bolsters | Simplex |
| Brake-beams | Simplex |
| Brakes | Westinghouse |
| Brasses | National-Fulton |
| Couplers | R. E. Janney |
| Draft rigging | Miner |
| Dust guards | Ryan |
| Journal boxes | McCord |
| Trucks | Andrews |
| Wheels | Griffin |

*The Chicago & Eastern Illinois*, as reported in our issue of November 30, has ordered three buffet-library and three chair cars

from the Pullman Co., for July and August, 1907, delivery. These cars will measure 69 ft. 6 in. long and 9 ft. 6 in. wide, inside measurements, and 6 ft. 10 in. high between sill and plate. The special equipment for both includes:

| | |
|---|---|
| Bolsters | Pullman |
| Brake-beams | Diamond special |
| Brake-shoes | Lappin |
| Brasses | Hewitt make |
| Couplers | Janney |
| Curtain fixtures | Forsyth |
| Curtain material | Pantasote |
| Door fastenings | Pullman |
| Draft rigging | Westinghouse |
| Dust guards | Positive |
| Heating system | Pullman |
| Paint | Pullman standard |
| Roofs | Pullman standard |
| Vestibules | Pullman standard |
| Wheels | Standard steel tired |

*The Delaware & Hudson*, as reported in our issue of November 16, has ordered for the Quebec, Montreal & Southern 1,400 steel underframe box cars of 60,000 lbs. capacity and 100 steel underframe stock cars of 60,000 lbs. capacity from the Canada Car Company. The box cars will weigh 36,500 lbs., and will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements, and 36 ft. 9¼ in. long over sheathing, 9 ft. 1¼ in. wide and 13 ft. 3 in. high over all. The bodies will be of wood. The stock cars will measure 36 ft. long, 8 ft. 6 in. wide, and 8 ft. high, inside measurements. The bodies will be of wood. The box cars will have Security doors, Chilton Paint Company's paint, and Chicago roofs. The stock cars will have roofs of double boards and Security door fixtures. The following special equipment is the same for both types of cars:

| | |
|---|---|
| Axles | Cambria steel; Coffin process |
| Bolsters (truck) | Am. Steel Fdy and Gould cast-steel |
| Brake-beams | Simplex |
| Brake-shoes | Diamond "S" |
| Door fastenings | "B" positive; Waukesha Malleable Co. |
| Draft rigging | Miner |
| Springs | Railway Steel Spring Co. |
| Trucks | Arch bar |

## RAILROAD STRUCTURES.

Appin, Ont.—A steel bridge is to be built here to cost $15,000.

Birmingham, Ala.—Contracts are reported let for putting up a combined office and freight house for the New Orleans & Northeastern to cost $30,000.

Bloomington, Ill.—The planing mill at the Chicago & Alton shops was totally destroyed by fire December 18; loss $60,000.

Charlottetown, P. E. I.—Application has been again made by residents of this place to the Canadian Government to build a tunnel under the Northumberland Strait to connect Prince Edward Island with the mainland. The width of the strait between Cape Traverse, P. E. I., and the northeast coast of Westmoreland County, N. B., is about five miles.

Chicago, Ill.—The Chicago, Burlington & Quincy freight house at Harrison and Canal streets was recently damaged by fire; loss about $300,000.

Eldorado & Wesson.—An officer writes that this company has completed grading on 10.19 miles of new road in Union County, Ark., and expects to have the track laid by February 1.

Interborough Rapid Transit.—This company is building a steel viaduct on Broadway, New York City, from the Harlem Ship Canal branch to 242d street, 1.55 miles. T. P. Kingsley has the contract for the foundation work, the American Bridge Co. for the steel structure, and Terry & Trench for the erection of the structure. On the subway extension to Brooklyn from Bowling Green, near the southern end of Manhattan Island, under the East river to Joralemon street, Brooklyn, and thence under that street and Fulton street and Flatbush avenue, 2.55 miles, the work is so far advanced that men have passed through under the river. The contractors are the New York Tunnel Company, of New York, for the river tunnels, and Crawford & McNee, of Brooklyn, for the subway work in Brooklyn. There are to be twin tunnels under the river.

Jacksonville, Fla.—Permission has been granted the Seaboard Air Line to put up a brick warehouse 40 ft. x 510 ft. here.

Kildonan, Man.—The question of building a steel bridge over the Red river, at a cost of $100,000, is to be submitted to the taxpayers on December 18.

Lachine, Que.—It is thought that the Grand Trunk will build a new station here.

Michigan Central.—An officer writes that this company will complete during the present year second track work in Canada aggregating 94 miles as follows: Between Springfield, Ont., and Hagarsville, 46.46 miles; Tilbury and Ridgetown, 30.48 miles; Welland and Bridgebury, 17.29 miles.

Minneapolis, Minn.—It is said that a new passenger station will be put up at this place during 1907.

New York, N. Y.—Bids were recently opened by Bridge Commissioner Stevenson for the construction of the foundation, abutment core and metal work of the steel viaduct Queens approach of the Blackwell's Island bridge across East river. The Buckley Realty Construction Company, of New York, was the lowest bidder, offering to do the work for $797,804. The other bidders were: Snare & Triest Company, $885,830; American Bridge Company, $918,098; Terry & Tench, $919,500; Carbon Steel Company, $945,319; Williams Engineering & Contracting Company, $1,035,592, and King Bridge Company, $1,157,443. The Bridge Commissioner will make the award as soon as possible. Commissioner Stevenson plans to have the bridge completed by December, 1908.

Parry Sound, Ont.—The Canadian Pacific is to build a steel bridge over the Seguin river, at a cost of $300,000.

Portage la Prairie, Man.—A large station and freight sheds are to be put up here by the Grand Trunk Pacific and Midland Railways.

Quebec, Que.—The Canadian Pacific has definitely decided to replace the Chateau Frontenac with a modern structure at a cost of $1,000,000.

St. Paul, Minn.—According to local reports, plans are being made for a new union passenger station to be put up at this place. William L. Darling, President of the Union Depot Co., will soon make public plans for the proposed improvements.

Stratford, Ont.—Plans are being made for additions to the Grand Trunk shops here to cost $200,000.

Superior, Wis.—The Wisconsin Central, it is said, has bought ground at this place, also at Duluth, Minn., as a site for terminals, shops and new yards for its Superior division.

Winnipeg, Man.—The provincial government, through the Minister of Public Works, has granted the request of Winnipeg and St. Boniface for a grant of $125,000 for the building and acquiring of bridge communication between the two cities.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—At a recent meeting of the directors of this company in Topeka, Kan., an increase in the capital stock was authorized, part of the proceeds of which are to be used for building a line from Texico, N. Mex., to Brownsville, Tex., and a number of other small lines.

Barrie & Orillia.—Application will be made by W. A. Boys, solicitor, of Barrie, Ont., for authority for this company to build lines from Grenfell to Barrie, Barrie to Orillia, and branches.

Burrard-Westminster Boundary Railroad & Navigation.—Under this name a company is applying to Parliament for a charter to build a line from Vancouver, B. C., to Burrard Inlet, with a number of branches. Tupper & Griffen, Vancouver, B. C., are the solicitors for the company.

Canadian Northern.—Notice is given that application will be made to the Dominion Parliament for authority to build the following lines:

A branch from a point at or near Humboldt, Sask., southwesterly to Township 29, west of the third meridian, then westerly and southwesterly to Calgary, Alberta; a branch from a point in Township 29, west of the third meridian, southwesterly to a point on the Qu'Appelle, Long Lake & Saskatchewan Railroad's line between Craik and Bladworth; an extension of the lines authorized by Chapter 52 of the statutes of Canada, 1901, section 5, subsection (a), westerly to a point in Township 5, west of the second meridian, thence northwesterly to Township 16, west of the second meridian; a branch from a point at or near Humboldt, Sask., northwest to a point in Township 43, west of the second meridian; a branch from a point at or near South Battleford, Sask., westerly to a point in Township 44, Range 27, west of the third meridian; a branch from a point at or near North Battleford, Sask., northwesterly to a point in Township 59, west of the fourth meridian; a branch from Strathcona, Alb., southerly to Calgary; a branch from Regina, Sask., southwesterly to a point on the international boundary; from a point at or near Saskatoon, Sask., southwesterly to a point on South Saskatchewan river; from a point at or near Edmonton, thence by the most feasible route to a point on the Pacific coast; from a point near the forks of the Athabasca and McLeod rivers in Alberta southwesterly to the headwaters of the McLeod river; from Battleford westerly 100 miles; a branch from a point at or near Strathcona southwesterly to Pigeon Lake, Alberta; a branch from a point south of Neepawa, Man., northwesterly, joining the main line at or near the crossing of the South Saskatchewan river.

Canadian Northern Ontario.—The first train was run on Nov.

19 over the line from Parry Sound to Toronto, formerly known as the James Bay Railway.

See Canadian Northern.

CANADIAN ROADS.—A company is seeking permission to build a line from the northern boundary of the Province of British Columbia to Dawson City, Yukon. Henry Blitz and Louis Aurebach, Boston, Mass., are the applicants.

CHARTIERS SOUTHERN.—Incorporated in Pennsylvania with $200,000 capital to build a line through Cecil, North and South Strabane, Somerset and West Bethlehem townships in Washington County, approximately 18 miles. E. B. Taylor of Sewickley is President and S. E. Scott of the same place is a Director. The other Directors include Joseph Wood, J. W. Renner, James McCrea, J. J. Turner and A. P. Burgwin, of Pittsburg. All these are connected with the Pennsylvania Railroad.

CHICAGO & NORTH-WESTERN.—See South Dakota Roads.

CHICAGO & NORTH-WESTERN.—The new line of this company, the Pierre, Rapid City & North-Western, between Rapid City and Pierre, S. Dak., has been opened for traffic from Fort Pierre to Midland, 49.1 miles, and from Rapid City to Owanka, 44 miles.

The line between Green Bay, Miss., and Gillett, 32.86 miles, has been opened for traffic.

CHICAGO, BURLINGTON & QUINCY.—According to reports from Themopolis, this company has given contracts to Bishop Crosby, head of the Mormon Church in northern Wyoming, for grading the Frannie-Worland branch from Worland, Wyo., south to Thermopolis, about 40 miles. The line will pass through the canyon of the Big Horn, and it will be necessary to blast a roadbed through much solid rock; also to cross and recross the Big Horn river several times. The work is to be completed to Thermopolis in about two years.

CHICAGO, MILWAUKEE & ST. PAUL.—See South Dakota Roads.

CLEVELAND, ALLIANCE & MAHONING VALLEY (ELECTRIC).—This company has been organized in Ohio to build an electric line from Cleveland through Ravenna to Alliance, with a branch from Ravenna to Newton Falls. The company has leased a line for its branch between these points from the Baltimore & Ohio for 15 years, with the privilege of buying during the first five years. David Morrison is President; F. H. Townsend, Treasurer, and C. R. Morley, Secretary.

CLEVELAND & SHARON TRACTION.—This company, which was recently incorporated with $2,500,000 capital, has completed its organization by electing officers as follows: President, Francis B. Morgan, Cleveland, Ohio; Vice-President and Secretary, John Blake, Brooklyn; Treasurer, C. F. Clendenning, New York; Assistant Secretary and Treasurer, P. M. Morgan, Cleveland, Ohio. This company purposes to build a line from Middlefield, Ohio, to Sharon, Pa.

CRAWFORD BAY & ST. MARY'S.—Application has been made to the Dominion Parliament by J. B. T. Garon on behalf of this company, to build a line from Lethbridge, Alb., to Hartney, Man.

EDMONTON (ALB.) STREET RAILROADS.—The city council has rejected the offer of the Canadian White Co., Montreal, to build, equip and operate an electric street railroad at Edmonton, and will build the line by contract and the city will own and operate it.

EDMONTON, DUNVEGAN & BRITISH COLUMBIA.—This company has applied to Parliament for incorporation to build a line from Edmonton, Alb., to Fort George, B. C. Pringle & Guthrie, solicitors, are making the application.

GLEN MARY RAILWAY COMPANY.—Incorporation has been granted this company in Tennessee, with $50,000 capital, to build a line from a connection with the Cincinnati Southern near Glen Mary, Scott County, through Morgan and Roane counties to Oliver Springs. The incorporators include J. N. Scott, G. N. Chandler, H. M. Cain, R. N. Jones and Robert Walton, of Roane County.

KANSAS CITY, MEXICO & ORIENT.—See article on this road elsewhere in this issue.

KLONDYKE MINES.—This company has applied to the Dominion Parliament, through McGivern & Dadon, for an extension of time in which to build its line.

MINNEAPOLIS & ST. LOUIS.—See South Dakota Roads.

MISSISSIPPI CENTRAL.—An officer writes that this company has recently completed and put in operation its road from Brookhaven, Miss., southeast to Hattiesburg, 83 miles. Track has been laid from the latter place southeast for 10 miles, and eight miles additional has been located, part of which is under construction. Bowles & Hemingway are the contractors. On the Natchez & Eastern, under which name the western extension of this road is being built from its northern terminus at Brookhaven west to Natchez, a length of 66 miles has been located and 45 miles of this under contract. Additional contracts are to be let at once for the remaining 21 miles. Contracts for all steel bridges have also been let. F. L. Peck is President, and James Archbald, Chief Engineer, of Hattiesburg, Miss. (Nov. 2, p. 123.)

NATCHEZ & EASTERN.—See Mississippi Central.

NEW BRUNSWICK ROADS (ELECTRIC).—According to reports from Fredericton, N. B., James Burgess and J. F. Tweedie, both of Victoria county, are applying for incorporation of a company to build an electric line from St. Johns, N. B., to Grand Falls, about 130 miles.

NEWCASTLE & NEW WILMINGTON.—Incorporated in Pennsylvania with $60,000 capital to build a 10 mile line in Lawrence County. J. H. Veazey is President; J. J. Ashenhurst, C. Freeman, C. E. Trainor and G. N. Nealy, of New Wilmington, and others, are Directors.

NEW ORLEANS & GREAT NORTHERN.—A contract has been given by this company to C. D. Smith & Co., of Memphis and Birmingham, for extending its road up the west bank of Pearl river from Jackson to Edinburg, on the eastern border of Leake County. The proposed extension will follow the survey outlined by the Pearl River Valley Railroad, which was chartered early this year, and has since been absorbed by the N. O. & G. N. Work is to be started early next year.

OKLAHOMA, TEXAS & GULF.—An officer writes that this company, which was recently incorporated in Texas, will ask bids next month for building its proposed line. The route is from Clarendon, Tex., through Balir, Roosevelt, Apache, Marlow, Ardmore and Lehigh, Okla., to Hope, Ark., approximately 350 miles. The work includes heavy trestle over North Fork and the Salt Fork of Red river. (Nov. 23, p. 145.)

PENNSYLVANIA.—It is reported that the company is considering the construction of a freight line over the Susquehanna River at Sunbury and down the west side of the river to a connection with the yards at Selinsgrove and Enola.

The construction of the new line along the Middle Division between Newton Hamilton and Ryde has progressed to a surprising degree, considering the nature of the work. The Drake & Stratton Co. has been pushing its forces night and day and a large amount of earth has been transferred from the deep cut between Mount Union and Newton Hamilton to other portions requiring a fill. The Eyre-Shoemaker Construction Co. expects to complete the new stone arch bridge over the Juniata river just east of Mt. Union by January 1. The grading part will take another year to finish. There is a big fill from the river east of Mt. Union to the mouth of Jack's Narrows, as much as 40 ft. in places. The subways at Division and Jefferson streets, Mt. Union, are completed, and the foundation for the new station at the same place is being laid. The completion of this big piece of work will do away with several bad curves. There will be four tracks on the new line.

See Chartiers Southern.

QUEBEC CITY RAILROADS.—The committees appointed to report upon the best system of communication between the Quebec bridge and the city will recommend the construction of a railroad with docks built out into the stream to 55 ft. of water. The line would run from the bridge parallel with Champlain street, with a union station at Champlain market. The estimate for the improvements along the river front, with the proposed terminals, is $15,000,000.

SAN DIEGO & ARIZONA.—According to reports from San Diego, Cal., John D. Spreckels and associates have decided to build a line from San Diego, Cal., east across the state and through the Imperial valley to Yuma, Ariz. Articles of incorporation of the company have been filed in California. The company is capitalized at $6,000,000.

SOUTH DAKOTA ROADS.—While the winter weather is hampering railroad work in this state, some of it is being pushed along regardless of cold and snow. The Chicago & North-Western work west from Pierre on its extension to the Black Hills has rails laid and trains operating from this place west to Midland, 50 miles. This is to be the principal point between this place and the Black Hills. From the western end at Rapid City line has been completed and is in operation to Dakota City on Cheyenne river, about 40 miles. While this is as far as they will attempt any operating work for the winter they are pushing along with their track, and expect to finish their relay from this end before they quit, to a point 20 miles west of Midland. The contractors, Roberts Bros., of St. Paul, also have a contract for about 200 miles on the Milwaukee line west from Mobridge and want to put their outfits on that work as soon as they can begin in the spring, which accounts for their rushing cold weather work. From the west end the work will be pushed about six miles down the valley of the Cheyenne river from Dakota City to the location of the bridge across the Cheyenne river so that work can begin on that structure, and that be ready to cross on in the spring to push ahead with the work. With these projects completed the North-Western will have about 40 miles left to complete in the spring from the eastern part of the state to the Black Hills. The new line is being surfaced with gravel as fast as it is com-

pleted, and will be in shape for continuing work as soon as spring opens, as the gravel surface will give them a roadbed on which they can work regardless of weather. In the spring the company will begin the construction of a twenty-five stall roundhouse and extensive shops at Pierre on a tract which was purchased for that purpose early this year. Excavation work has also been started for a large stone station and office building which is to be erected next year. Work on the bridge here is progressing slowly, and while the contract calls for a completed bridge by the first of June the chances are that it will not be done by that time, as but two caissons out of eight have yet been sunk, and work is just beginning on two more.

The extension of the Chicago, Milwaukee & St. Paul's line from Chamberlain to the Black Hills is at a standstill at present, with the exception of the work in some of the heavier cuts. Track has been laid for about 70 miles out of Chamberlain, but only a small part of it is graveled. The line is in operation as far as Murdo from the river, and track has been laid for some distance west of that place. Work trains are being run west of Murdo. From Rapid City most of the grading is completed, except the heavy cuts, as far as Cheyenne river, and rails laid for about 15 miles from that place; track laying has been discontinued until the spring.

The Minneapolis & St. Louis has completed its line from Watertown to Aberdeen, and is operating this part of its system which will be in this state. No attempt to build from Aberdeen to Leola on its northwest line will be made before spring, or on its line west to the river. This company has been doing the most rapid construction work of any of the roads in the state this year, but have been building over a comparatively level country, with no large streams to cross.

It is expected that the Great Northern will start work in the spring to reach a point on the Missouri river; there is a good grade at their disposal between Pierre and Aberdeen, that is looked upon as the most probable route they will take. Representatives of that system have been traveling over that grade several times in the past few months.

The Yankton & Gulf, in which Senator Gamble is interested, projected from Yankton to the Gulf, will not be much of a Dakota road if built. The Cincinnati parties who are backing it are active in preliminaries, and may build the line.

Texas Railway Company.—The Hipp Construction Company, which has the contract to build part of this company's proposed line from Port O'Connor, on the gulf coast to San Antonio, with a branch to Gonzales, a total of about 250 miles, has resumed grading work on the first division between Victoria and Yoakum. The old grade of the Guadalupe Valley between Victoria and Port O'Connor, which was never used by its original builders, has been acquired by the new company and is being restored preparatory to track laying. (April 13, p. 116.)

Yankton & Gulf.—See South Dakota Roads.

## RAILROAD CORPORATION NEWS.

Buffalo, Rochester & Pittsburg.—The directors of this company have sold the $3,999,500 stock of the Rochester & Pittsburg Coal & Iron Company to the Mahoning Investment Co., incorporated in Maine with $4,200,000 capital stock. The railroad company receives in payment $4,125,000 stock of the Mahoning Investment Co. This last named stock is to be distributed to the holders of the $10,500,000 common stock and $6,000,000 preferred stock of the B., R. & P. at the rate of one share of Mahoning Investment Co. for every four shares of B., R. & P. stock held on December 20, 1906.

Chesapeake & Ohio.—Scott & Springfellow, Richmond, Va., representatives of the minority stockholders who have been trying to get an increased dividend, have issued a circular maintaining that the railroad company's reasons for not paying higher dividends are insufficient. The railroad company declared that there were not enough funds on hand to warrant any increased distribution, but Scott & Springfellow answer that according to balance sheets for the seven years previous to 1906 the excess of current liabilities over current assets during that period ranged from $1,000 to $758,000; therefore, according to the argument of the railroad management, no dividends should have been paid at all during those years. The circular argues that the dividend rate is a question of earnings and not of the temporary condition of the treasury. It agrees that the company needs more capital.

Chicago, Milwaukee & St. Paul.—At a meeting on December 17, the directors decided to offer at par until January 10 to stockholders of record December 19, $66,327,100 preferred stock and $33,183,740 common stock at the rate of one share of common and two shares of preferred for every four shares of either class already held. There is now outstanding $49,654,400 preferred and $82,986,700 common stock. It has for some time been believed that on September 29 increases of $75,000,000 in authorized preferred and $75,000,000 in authorized common stock were made. Of the proceeds of the sale of the new stock, $75,000,000 is for the extension from Evarts, S. Dak., west to the Pacific coast, and the remainder is for contingencies.

Chicago, Rock Island & Pacific Railway.—This company has declared a quarterly dividend of 1 per cent. payable January 2 to stockholders of record on December 27. In July, 1906, 1 per cent. was paid; in April, 1½ per cent., and in January, 1½ per cent. from the earnings of five months. The annual rate during 1905 was 6¼ per cent.

Lehigh Valley.—The directors have declared on the $40,334,800 common stock the regular semi-annual dividend of 2 per cent. and an extra dividend of 1 per cent., payable January 12 to holders of record December 29. The annual rate has been 4 per cent. since 1904, when 1 per cent. was paid; nothing was paid during the ten years previous.

Mahoning Investment Co.—See Buffalo, Rochester & Pittsburg.

Manila Railroad.—See Manila Railway.

Manila Railway.—Under this name a company has been incorporated in Great Britain as a holding company for all the bonds and stocks issued by the Manila Railroad Co., which is building about 420 miles of road on the Island of Luzon, Philippine Islands, and will also take over the Manila & Dagupan, 208 miles long. The new company will have $10,000,000 5 per cent. non-cumulative preferred stock, $10,000,000 common stock, $15,000,000 4 per cent. "A" debenture bonds and $15,000,000 4 per cent. "B" debenture bonds.

Mexican Central.—Announcement has been made that the negotiations for the consolidation of the Mexican Central and the National Railroad of Mexico, and the acquisition by the Mexican Government of control of the consolidated company have been closed. The Government now owns about 47 per cent. of the $65,350,000 outstanding stock of the National of Mexico; there are four classes of stock: common, first preferred, second preferred and deferred. The road has outstanding $48,449,000 mortgage bonds and $8,500,000 collateral notes, the last named being due October 1, 1907. The Mexican Central has $59,454,300 outstanding stock; $66,874,000 consolidated mortgage 4 per cent. bonds of 1911, $32,178,200 income bonds and some $32,000,000 collateral trust bonds and notes. It is believed that the consolidated company will issue prior lien bonds and second mortgage bonds to fund the present indebtedness of the two companies, and that the Mexican Government will guarantee the interest and sinking fund on the new second mortgage bonds.

New England Investment & Security Company.—This company, organized some months ago as a holding company for the New York, New Haven & Hartford electric lines in Massachusetts, has declared an initial dividend of 2 per cent. on the $20,000,000 4 per cent. cumulative preferred stock. (Sept. 21, p. 76.)

Northern Pacific.—A meeting of the stockholders has been called for January 7 to ratify an increase of capital stock from $155,000,000 to $250,000,000. Of the additional stock, $93,000,000 is to be offered to stockholders of record December 31 for subscription at par on or before January 15 to the extent of 60 per cent. of their present holdings. The proceeds of the new stock are to be used for improvements and new lines.

Pennsylvania Eastern.—This is the new name of the Quakertown & Eastern, which runs from Quakertown, Pa., to Riegelsville, 15 miles, and has $180,000 outstanding stock and $180,000 outstanding first mortgage 5 per cent. bonds of 1927.

Pittsburg & Lake Erie.—A meeting of the directors has been called for February 28 to act on a proposition to increase the capital stock from $10,000,000 to $30,000,000. The proceeds of the sale of the additional stock are to be used to pay for the four-tracking of the road from Pittsburg, Pa., to Youngstown, Ohio, 68 miles; for new freight terminals in Pittsburg; for a bridge over the Ohio river and for rolling stock.

Quakertown & Eastern.—See Pennsylvania Eastern.

Richmond, Fredericksburg & Potomac.—A scrip dividend of 25 per cent. has been declared on the $1,360,950 common stock and the $1,072,000 "dividend obligations," which receive the same dividend as the common stock. It is payable January 3 to holders of record December 20.

Toluca & San Juan.—See Toluca, Tenango & San Juan.

Toluca & Tenango.—See Toluca, Tenango & San Juan.

Toluca, Tenango & San Juan.—This company, incorporated with $500,000 capital stock, is a consolidation of the Toluca & Tenango and the Toluca & San Juan. The two roads operated 35 miles of road in the province of Mexico, Mex.